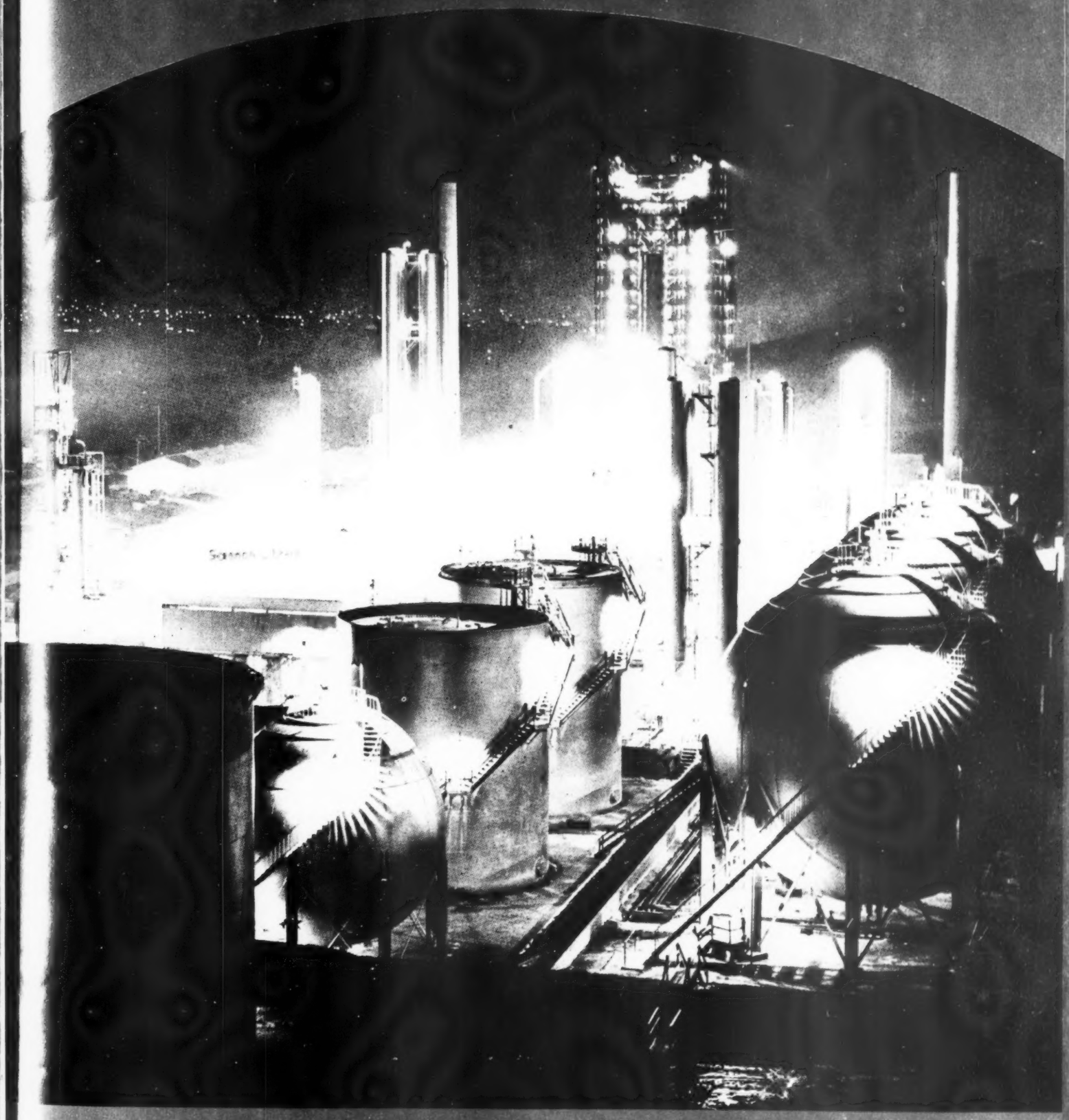
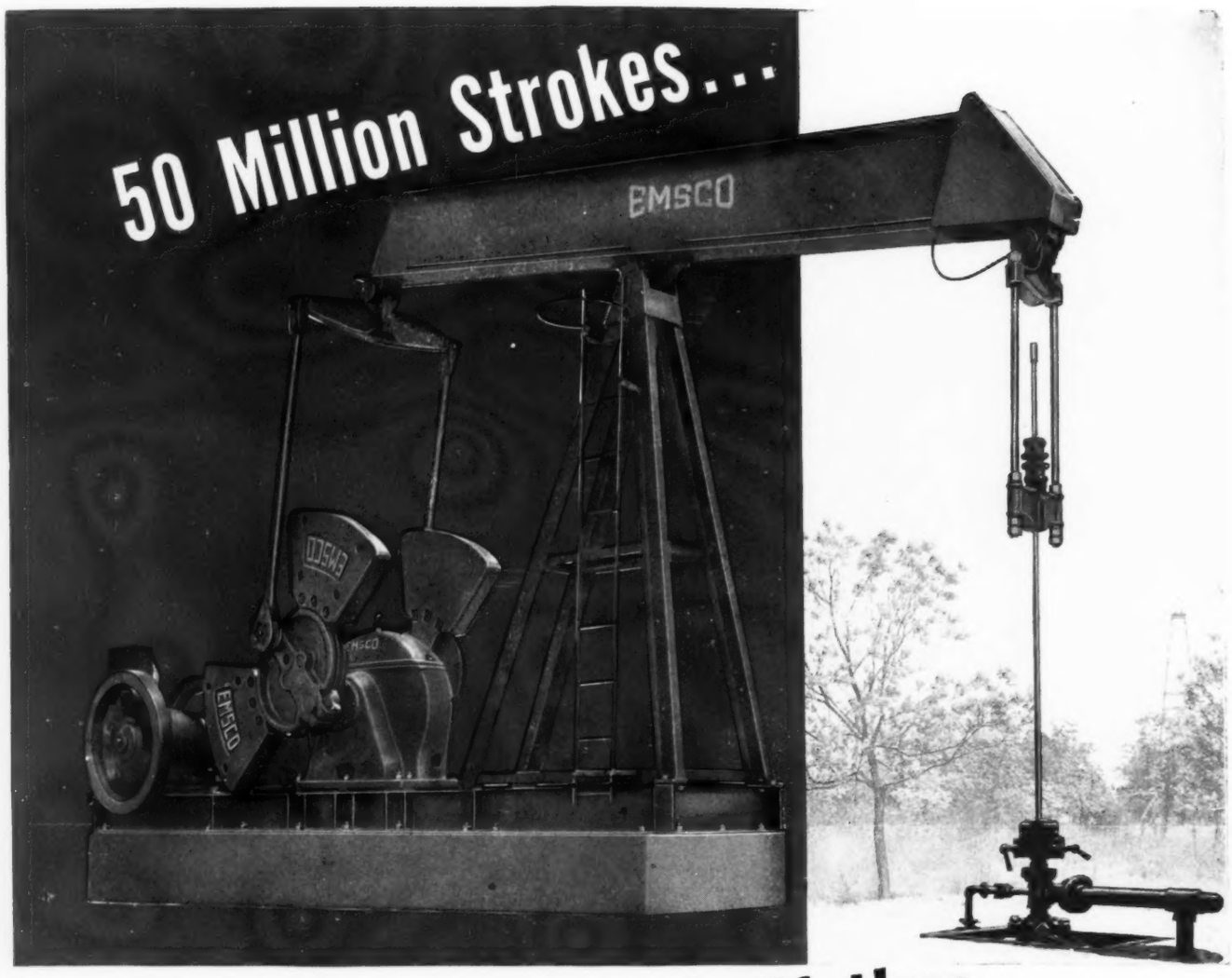
WORLD PETROLEUM

FEBRUARY, 1946



FIVE DOLLARS PER YEAR—FIFTY CENTS PER COPY



...is only a part of a lifetime

SADDLING A WELL HEAD IS OUR JOB

50 million working strokes covers only a portion of the life-span of thousands of Emsco Unit Pumpers now in operation. Long life is the specification to which every feature is designed.

EMSCO UNIT PUMPERS are manufactured for light, medium and heavy pumping loads and with a range of pumping speeds and strokes to meet any pumping conditions. Emsco Unit Pumpers give dependable operation after years of service.

EMSCO DERRICK & EQUIPMENT COMPANY

HOUSTON, TEXAS LOS ANGELES, CALIF. DALLAS, TEXAS

EMSCO

REG. U.S. PAT. OFF.

an important feature of the Tube Turns line

WHEN a 180° fitting must be cut to an odd angle to meet special conditions, uniform wall thickness is of prime importance. Tube-Turn fittings have uniform wall thickness within ASA tolerances at all points throughout the fitting. Cut to any odd angle, they will line up perfectly with the pipe.

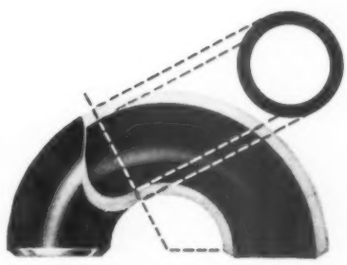
There are more than 4,000 items in the complete Tube Turns line—the *first* line of seamless welding fittings, in point of time, in strength, safety, economy and efficiency. Among refineries, processing plants, power plants and equipment manufacturers, Tube-Turn welding fittings are known for all around excellence and dependability.

The long and varied experience of Tube Turns engineers is available to you through selected Tube Turns distributors in every principal city, commanding the full resources of all Tube Turns branches and the home office. Write today for your free copy of Catalog 111.

• • •

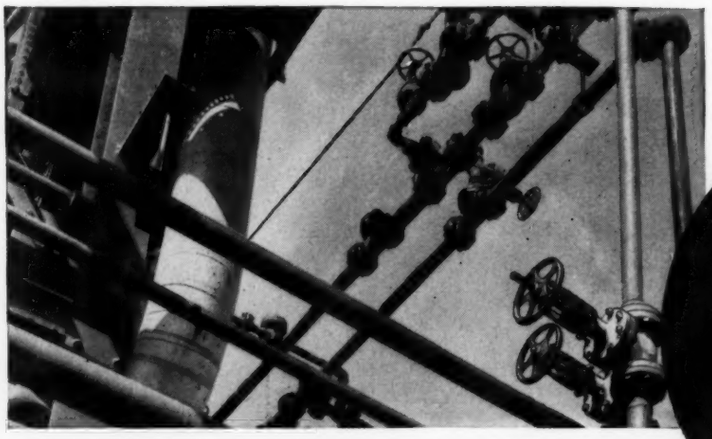
Selected Tube Turns distributors in every principal city are ready to serve you from their complete stocks.

TUBE TURNS (Inc.), Louisville 1, Kentucky. Branch Offices: New York, Washington, D. C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston, San Francisco, Seattle, Los Angeles.



Quality control and inspection assure uniform wall thickness within ASA tolerances at all points. Full circularity is maintained throughout.

TUBE-TURN TRADE MARK **tt** *Welding Fittings and Flanges*



HOT OIL SERVICE—Crane 600-pound Cast Steel Globe Valves in gasoline and vapor lines from top of cracker.

COOLING WATER SYSTEM with Crane Standard Iron Body Wedge Gate Valves in piping to pumps.

CRANE . . . Headquarters for Refinery Piping Materials

ONE SOURCE OF SUPPLY
RESPONSIBILITY
STANDARD OF QUALITY

It's the big variety of piping requirements in refinery operations that makes Crane service so valuable. For power or process lines—for all working conditions—Crane supplies everything: valves, fittings, pipe, fabricated piping and all accessories. You choose from the world's greatest line of brass, iron and steel materials.

For hot oil lines, stock storage or steam systems, for example, a single order to your nearby Crane Branch or Wholesaler covers all piping equipment from end to end. Simplified buying with undivided responsibility means time-saving, trouble-free installations. And with uniform Crane quality in every item, there's no better way to insure smooth-working, low-cost piping performance.

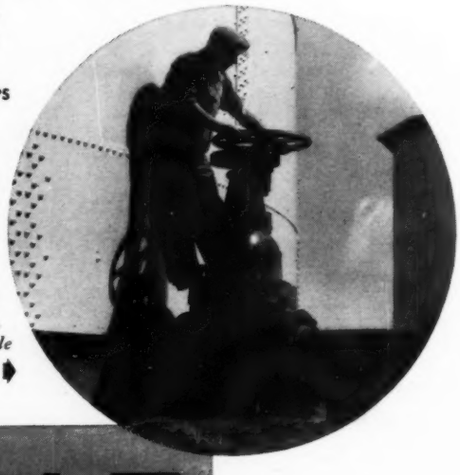
CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

OIL FURNACE INLET LINES equipped with Crane 1500-pound Alloy Cast Steel Globe Valves.

FOR STORAGE SYSTEMS, Crane supplies all piping materials. Shown is a Crane 16-in. gear-operated Ferrosteel Double Disc Gate Valve.



EVERYTHING FROM . . .

CRANE

FOR EVERY PIPING SYSTEM

WORLD PETROLEUM

Founded by Russell Palmer

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

VOLUME 17 | FEBRUARY, 1946 | NUMBER 2

CONTENTS

Technological Progress Aids Conservation 23

Committee Would Eliminate Germany's Synthetic Industry .. 24

Shell's New Sheridan Cycling Plant 28

New Period of Refinery Construction 30

Motor Voltage Considerations in Oil Refineries 33

Research Emphasized in Oil Company Plans 34

International News and Notes 40

Oil Company Staff Changes 42

Capital Sidelights on Oil 46

Rex W. Wadman
General Manager

E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

H. Arnold Jacobsen
Art Director

Front Cover — General View, Standard of California's 100 Octane Plant, Richmond Refinery.

SUBSCRIPTIONS: Annual subscription is offered at the flat rate of $5.00 (U. S.) postpaid. Single copies are obtainable at 50 cents. • Address all correspondence regarding subscriptions to the publishers at Orange, Connecticut, or 2 West 45th Street, New York 19, N. Y. Address all correspondence regarding editorial and advertising matters at 2 W. 45th St., New York 19, (Tel. MUrray Hill 2-7333). Published by Mona Palmer Trustee under the will of Russell Palmer.

BRANCH OFFICES: London: Georgian House, St. Jame's, London, S. W. I. • Mid-Continent Advertising Manager: O. F. Cozier, 515 McBirney Bldg., Tulsa 3, Okla. (Tel. 4-5555) • Mid-West Advertising Manager: Wilard R. Cotton 307 No. Michigan Ave., Chicago 1, Ill. (Tel. Franklin 2508) • Michigan Manager: R. F. Pickrell, 314 Stephenson Bldg., Detroit 2 (Tel. Trinity 1-0790) • Cleveland Advertising Manager: Frank J. Enright, Union Commerce Bldg., Cleveland 14, Ohio (Tel. Main 5693). Western Advertising Manager: Walter S. Johnson, 412 West 6th Street, Los Angeles 14, Calif. (Tel Mutual 1391). Eastern Advertising Manager, Ralph F. Scholbe, 2 West 45th Street, New York 19, N. Y. (Tel. MUrray Hill 2-7333).

GASOLINE / GAS + COKE = CATALYTIC CRACKING EFFICIENCY

This simple equation illustrates one of the outstanding advantages of Houdry fixed-bed and T C C processes. Their yield of gasoline in ratio to fixed-gas and coke is the highest of all catalytic cracking processes. Other factors which favor Houdry-licensed processes are:

- low investment cost
- low operating cost
- high liquid recovery
- high quality and yield of gasoline
- stable products
- continuous engineering service

They all add up to greater profitability. Interested refiners, with a sharp eye on competitive trends, are invited to ask for detailed estimates.

HOUDRY PROCESS CORPORATION
WILMINGTON, DELAWARE
NEW YORK OFFICE: 115 BROADWAY, NEW YORK 6

Houdry Catalytic Processes and the TCC Process are available through the following authorized firms:

E. B. BADGER & SONS CO.
Boston, Massachusetts

THE LUMMUS COMPANY
New York City, New York

BECHTEL-McCONE CORP.
Los Angeles, Calif.

HOUDRY CATALYTIC PROCESSES
FOR VICTORY IN WAR
AND PROGRESS IN PEACE

EDITORIAL

TECHNOLOGICAL PROGRESS AIDS CONSERVATION

WITH the technological advances recently made available to the oil industry, some of them closely associated with the conduct of the war and others hastened in their development by the military demand for highly specialized products, the way is opened to a new era of practical conservation. True conservation, it must be borne in mind, implies the intelligent use of resources to realize their most useful and valuable potentialities, not merely locking them up in disuse as contemplated in some of the legislation proposed under this designation.

One of the noteworthy advances in the processing of petroleum has come about through the large scale employment of catalysts. The use of catalytic agents is not new but was vastly broadened during the war period with its tremendously enlarged demands for high octane gasoline and the recognition of the part that catalytic cracking was capable of playing in increasing the output of such products from materials not formerly considered utilizable for such treatment. Intensive study and experimentation has added greatly to the list of known materials having catalytic properties and has broadened the knowledge of their action so that we may feel measurably near to realization of the oil technologist's dream of a tailor made catalyst for each desired product. Transformation of residuals into more valuable light products, thereby reducing the amount of crude required for a given quantity of product is an example of the kind of conservation the oil industry has long been practicing.

Similar results are obtained from new applications of hydrogenation which likewise is a process long known but until recently not widely applied commercially. Hydrogenation of gas oil stocks, however, has demonstrated the feasibility of upgrading low-value materials for further catalytic cracking to produce more gasoline from a given amount of crude. Processes that have been developed are capable of yielding over 100 volume percent but their chief value is in raising the quality of the materials treated. The intention of the refining industry to take full advantage of the possibilities presented by these advanced methods is indicated by the announcement of projected early expenditures of over $100,000,000 for catalytic cracking equipment, alkylation and isomerization units.

An innovation which may have a far-reaching influence upon the refining industry of the United States will become a reality during the current year with completion of the first large scale plant for the production of gasoline from natural gas. This again is an adaptation of a process that has been in operation elsewhere for a number of years but which is now greatly changed and improved by American engineering. It is confidently predicted by the technical experts of the companies interested in this development that with the methods and equipment that are to be installed and with a plant of large capacity it will be possible to produce gasoline on a competitive basis with that processed from crude oil. If this expectation is realized it will vastly increase the country's resources for the production of the petroleum industry's most valuable product. Natural gas reserves of the United States are estimated to amount to 200 trillion cubic feet and the available supply is much greater than is required to meet the demands made upon it for other purposes.

In preparation for the time when present sources of petroleum supply may cease to be adequate the government, through its Bureau of Mines, is constructing an experimental plant for the recovery of oil from the country's vast deposits of shale and the Socony-Vacuum Oil Company has presented to the government a process for its production which may prove of great value to the nation in time to come. In another pilot plant the Bureau of Mines is investigating the possibilities of oil from coal. Both of these undertakings may be of remote rather than immediate commercial significance but they indicate the recognition that is being accorded to the necessity of making the most efficient possible use of a national resource that has contributed perhaps more than any other to the country's progress.

Avoidance of waste in the manufacture of petroleum products is assured through the continued efforts of the refining industry which have been exercised so successfully in this direction in the past. Effective conservation in the field of production depends upon sound and constructive action by the states fortunate enough to possess important deposits of petroleum. Some of these states already have laws and commissions which give practical effect to practices which have proved their efficiency in actual operation but which must be amended and improved from time to time to keep step with progress in the industry. Other states which have not acted in the matter have the way open to take this needed step through participation in the Interstate Oil Compact which for a dozen years has labored consistently and effectively to conserve oil and gas by the prevention of physical waste from any cause. The record made by this organization is the best assurance that knowledge of the most workable and efficient conservation practices will be kept continuously before the public.

Oil Plant at Magdeburg After Repeated Allied Bombings.

Committee Recommends Elimination Of Germany's Synthetic Industry

Destruction or Removal of Hydrogenation and Fischer-Tropsch Plants, Limitation of Imports and Close Supervision of Domestic Production Advised in Report Submitted by Group Representing Foreign Economic Administration, Enemy Branch.

Washington

GERMANY'S war-fostered synthetic oil industry will be a thing of the past, with stringent controls over its refining of natural crudes and imports to prevent stockpiling for another war, if the recommendations of the Foreign Economic Administration Enemy Branch are adopted and put into force by appropriate authority. Basis of FEA's plan for whittling down German activities in petroleum as a part of its economic and industrial disarmament program was the findings of a petroleum committee.

The oil group, officially designated the Technical Industrial Disarmament Committee to study the Treatment of the German Oil and Petroleum Industry, comprised Deputy Petroleum Administrator Ralph K. Davies, chairman; Bruce K. Brown, FEA consultant; Rear Admiral A. F. Carter, USNR, Army-Navy Petroleum Board; Brig. Gen. W. E. R. Covell, War Department, Office of QMG; E. DeGolyer, FEA Consultant; Brig. Gen. Howard L. Peckham, alternate for General Covell, War Department, Fuels and Lubricants Division; Joseph E. Pogue, FEA co sultant; Charles E. Rayner, petroleum advis State Department; and George H. Taber, FE consultant. Brandon H. Grove, Assistant Chi Petroleum Division, FEA, served as executive (ficer of the committee, with Walter Levy, Ch of the Oil Section, Office of Strategic Servi as co-executive officer, and Mrs. Miralotte Ick analyst, FEA, as executive secretary.

The committee's report was drafted by a "wo ing group" composed of Brandon H. Gr (FEA), chairman; Walter Levy (OSS), J A. Loftus (State Department), Robert W. T (OSS), Miss Sonia E. Adelson (OSS), Mrs. Miralotte Ickes (FEA). The "top" co

mittee has not accepted responsibility for the report as it never met in full session to discuss it and is now disbanded.

In making public its final report on disarmament of Germany, Henry H. Fowler, director of FEA's Enemy Branch, emphasized the "advisory" aspect of the program. It is not to be taken as an expression of the adopted policy or program of the United States, "except as the policy recommended may have been reflected in the Yalta declaration, the Berlin protocol, or public announcements by the President or the Secretary of State".

Briefly summarized, the conclusions of the drafting committee on petroleum are:

(1) The development of the synthetic oil industry was an essential part of Germany's autarchic program, which was an important phase of Germany's preparations for war. Except for the armament industry itself, probably no better example of a war industry can be found. It is, therefore, recommended that all Bergius hydrogenation and Fischer-Tropsch synthesis complexes be eliminated, either by destruction or transfer, and that the erection of new plants in Germany to produce oil synthetically from coal or other carboniferous materials by these or similar methods be forbidden.

(2) In view of the severe damage inflicted on the synthetic oil industry and the serious coal shortage in Europe, it is recommended that no attempt be made to repair the plant even for an interim period, and that the dismantling of the industry be undertaken in the near future.

(3) There appears to be some justification for a limited amount of imported crude oil or semi-finished products. Therefore, it is recommended that the import of crude and semi-finished products be controlled and limited in quantity and quality.

(4) As it is entirely possible that important new crude oil discoveries may be made in Germany, it appears desirable to introduce some form of control over the development of domestic crude production and its refining.

(5) Unless alcohol becomes a strategic fuel, it is recommended that no attempt be made to control or restrict its production.

(6) It is recommended that no attempt be made to control German shale oil production unless it is found that it is being produced in quantities sufficiently large to add substantially to Germany's war potential.

(7) It is recommended that no restrictions on the production and consumption of solid substitute fuels be introduced unless they are developed sufficiently by German technologists so as to be usable as motor fuel for military equipment.

As for the significance of the petroleum industry in Germany, the report says:

"Being poorly endowed by nature with petroleum deposits, and forseeing early that the coming war would be a war of movement which would require large amounts of oil and petroleum to run aircraft, tanks and combat vehicles, Germany attempted to free herself of dependence on imported supplies by developing synthetic oil production, beginning in 1927. Production was constantly stepped up, rising from 300,000 metric tons in 1935 to an annual rate of about five million tons early in 1944. The price of relative self-sufficiency is enormous, both from the point of view of raw materials and expenditure of labor. It is estimated that approximately five tons of coal and that five to ten times more working hours are required for the production of liquid fuels from coal than are necessary for the production of the same amount from petroleum.

"Germany began the war in September 1939 with stocks estimated at not more than 2-3,000,000 metric tons and production at an annual rate of roughly 3.4 million tons, of which about one-third was derived from Germany and Austrian crudes and about two-thirds from synthetic plants. Pre-damage capacity of the synthetic oil plants in German Europe is estimated at about 5.4 million metric tons annually. In addition crude oil production in the Altreich in 1944 is estimated at 711,000 metric tons. The annual pre-raid capacity of German crude oil refineries has been estimated at about 3.1 million tons."

The program of eliminating synthetic petroleum production and exploiting the limited supplies of natural crdues, the report says, is a double check on the revival of excessive capacity in the liquid fuels industry. Reconstruction of a synthetic industry, if disarmament control should ever break down, would take considerable time and require scarce raw materials and high technical skill, thus prolonging the period necessary for rearmament. During the intervening period, German indigenous crudes will be further depleted since imports of petroleum crudes and products will be greatly restricted. Also, there will be no longer be available excess capacity for processing imported crudes or synthetic products, should the Germans attempt to gain access to foreign crudes.

Referring to the manufacture of synthetic fuels, the committee said: "With the present techniques, the industry is not able to compete with the natural oil industry. The elimination of the industry, although it would probably cause certain short-run economic problems, would contribute in the long-run to the U. S. goal of a free and expanding world trade. Advances in technology, which would simplify the production process, make underground plants feasible, or eliminate the need for high quality products such as aviation gasoline, might, in the future make a prohibition of synthetic production difficult to enforce, but this is a problem which may be considered when and if it arises. Finally the reconstruction of a synthetic oil industry if and when disarmament control should ever break down would take considerable time and require scarce raw materials and high technical skill, thus prolonging the period necessary for German rearmament".

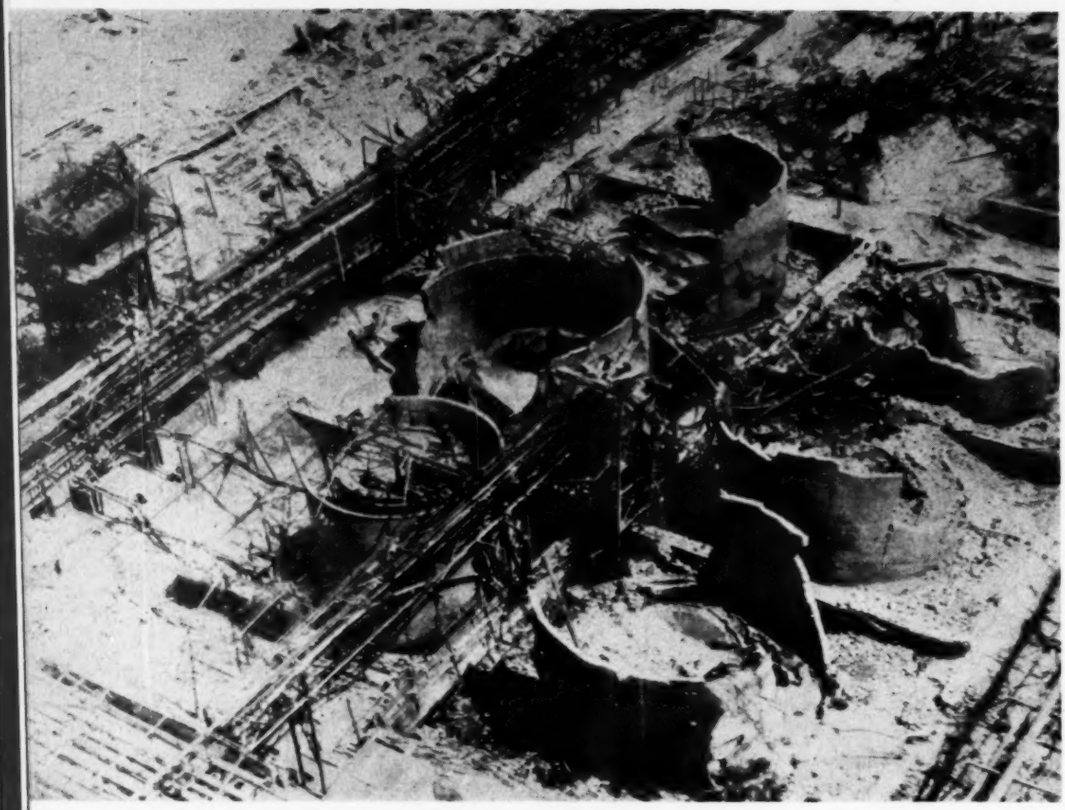
The term "synthetic oil industry" is used by the committee to designate only Bergius hydrogenation and Fischer-Tropsch synthesis complexes. Destruction or transfer of the plants would also involve the elimination of carbonization facilities for the preparation of feedstock which were associated with some of the synthetic plants. The capacity of Germany's remaining carbonization facilities, in the committee's opinion, should not exceed the level needed for an adequate supply of civilian and industrial requirements for coke.

Transfers of plants should be discouraged, the report pointed out, except where it can be shown that a plant would serve an economic purpose, as in an area rich in coal and remote from sources of natural oil. Also, where it could be shown that the plant is needed for research in methods of producing oil from coal.

The committee recommended "most strongly" that the procedures governing the destruction or dismantling of the synthetic oil industry be determined multilaterially by the Allied Control Commission, and applied uniformly throughout the four zones of occupation. How the controls are to be applied or modified in the post-occupation period was left to be determined "in the future in the light of whatever general pattern is finally decided upon".

"Because the global supply of petroleum for the foreseeable future will be one of abundance," the committee held, "the transfer and subsequent operation of synthetic oil plants would, in general, continue an uneconomic industry. However, it may prove that the production of synthetic oil is compatible with the economy and geography of the Soviet Union, and no barrier need be proposed to the transfer of synthetic oil plants to the U.S.S.R. in such case. Also, it may be deemed desirable to use all or parts of one or several plants for experimental and research purposes in Western Europe or in the Western Hemisphere.

"Synthetic plants which still remain after economic measures of disposal such as the foregoing have been applied should be destroyed. For this purpose they should be reduced to scrap, which in turn could be sold at current market prices, within or outside of Germany, and the proceeds be credited to the reparations account of all the United Nations having recognized reparation claims against Germany. The credits may be distributed among the claimant nations in proportion to the size of their aggregate claims.



Synthetic Plant at Bottrop, Near Gelsenkirchen, Which Once Produced 100,000 Tons Monthly for Nazi War Machine.

"With respect to the rights of German nationals having a financial interest in the synthetic oil industry, these should be subject to whatever general rights are recognized for German nationals in connection with the destruction or devaluation of property as a result of reparations or economic security measures.

"The rights of United Nations nationals, if any, who have minority interests in the corporate entities operating the synthetic plants may similarly be determined by any future decisions which affect such rights categorically."

The method "most apparent" to the Committee for keeping Germany from rebuilding its synthetic plants would be a "specific prohibition written into the terms of the peace treaty." But in spite of such a ban, the committee believes, it would be hard to enforce such a provision covering oil plants in the absence of a statistical control of all forms of industrial construction. The minimum enforcement machinery would appear to be the establishment of a commission representing the signers of the peace settlement on the part of the United Nations; a requirement that the German government report to the Commission at least quarterly on stocks, imports and production of construction materials and periodical inspection on a spot-check basis by agents of the Commision.

"The limitations which it may be desirable to place upon the development of indigenous refining capacity in Germany," the report said, "must depend to a considerable extent upon trends in post-war petroleum products, transportation costs, and other economic factors in the international movement of petroleum. The limitations which are placed upon German refineries may, therefore, be flexible but the administrative problem of enforcing such limitations is the same as that involved in enforcing prohibition of synthetic oil production. The fact that construction materials in relatively small physical volume can enhance materially the daily throughput capacity of a refinery, necessitates a still more minute and detailed examination of the projects lists that would be submitted to an external control commission onder the procedure recommended previously for the control of new synthetic plant construction".

The control of imports into Germany, the committee believes, would be relatively easy, provided the present allies continue to want to prevent their former enemy from accumulating oil stocks and require their nationals to cooperate to that end. Germany controls virtually no external assets in the form of oil-producing properties, and for this reason effective control of imports would depend on voluntary cooperation of private - principally British and American - petroleum products which would provide the bulk of import supplies for Germany. Wartime relationships between government and industry in Britain and the United States have been dissolved, and it would now be necessary to arrive at some understanding between the two countries and their nationals on this point.

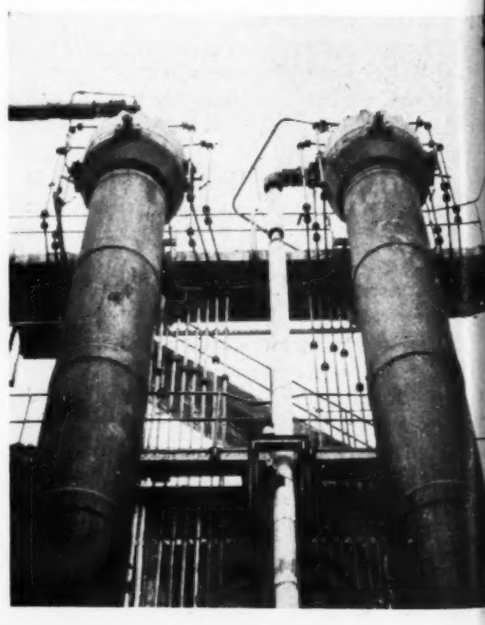
It may be necessary, the committee suggests, to devise some control over shipping and to insist on the transport of petroleum products for Germany only in tankers owned and operated by supplying companies that have agreed to cooperate in the control program.

"At no time in the past", the report points out, "has Germany been able to produce more than 15 or 20 percent of her total petroleum requirements from oil fields within her borders. This remains true despite intensive efforts to expand the volume of German crude oil production during the war years. Although it is improbable that the future will show any great change from the record of the past, is conceivable on geological evidence that large supplies of crude oil could be discovered within Germany. In any event, to maintain an adequate record of German oil supplies it is necessary to keep a regular record of the volume of German crude oil production. This may be done through a system of statistical reporting and random spot-checking such as has been reviewed for the other branches of the German oil economy. If future crude oil exploration should reveal large new supplies, it might become necessary to: (1) prohibit further exploration for oil; (2) deplete the new fields by a maximum rate of exploration even though this necessitated the export of German crude oil."

However, the committee believes that the discovery of new oil supplies appears "so improbable for the foreseeable future" as to make any detailed consideration of its control unnecessary.

The committee advanced the thought that elimination of the synthetic oil industry, coupled with the maintenance of the refining industry at a "high level of production" would lead to a sizeable German demand for crude, and a very small demand for finished products. If, in addition, refining of imported crude were prohibited, the "product composition of demand would be reversed". Demand for finished products would increase to the quantity necessary to satisfy consumption requirements, while the need for crude would "by hypothesis vanish". If elimination of

Converter Towers of Gelsenberg Plant Construction Plans of Which are Being Sent to U. S. for Study in Liquid Fuel Research.



the synthetic industry is assured, Germany would enter the world market only as a buyer.

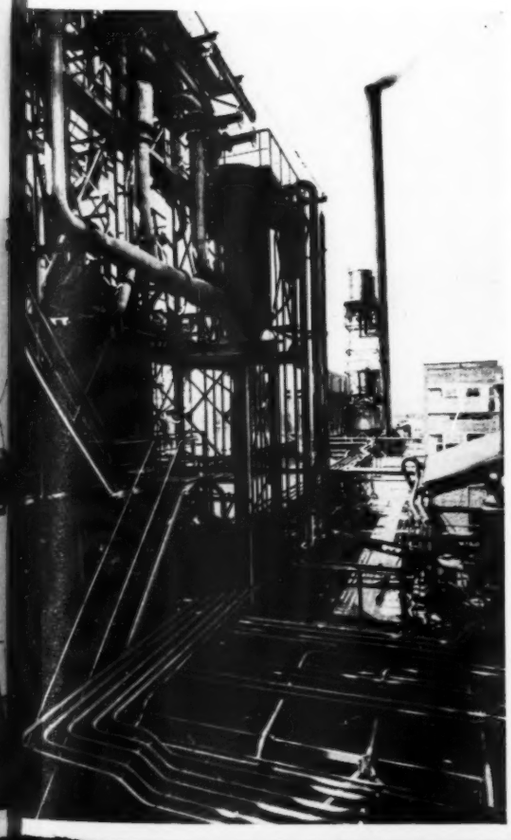
"Since Germany possessed extremely limited natural oil resources and depended on imports for a large share of its supplies, only small quantities of liquid petroleum products were available for export before the war," the committee pointed out. "Such exports were obtained from the refining of imported crude and semi-processed oil. German exports of liquid products fell from 233,000 tons in 1935 to 127,000 tons in 1938; the bulk of exports consisted of high-grade lubricants, which rose from 40 percent of the total in 1935 to 75 percent in 1938. German shipments of all liquid products other than high quality lubricants were both quantitatively and qualitatively negligible. Lubricants, on the other hand, were exported from Germany all over the world because of their high quality; Great Britain and Sweden were the two largest consumers, although each imported less than 20,000 tons of lubricants a year from Germany.

"The demand for these particular types of lubricants which are necessary for specific industry. In any case, a large part of this demand for these products has been satisfied by other suppliers since the outbreak of the war.

" A high level of production in the synthetic oil industry, combined with a low domestic consumption, would result in a gross export surplus of 5.5 million tons of liquid products a year in Germany. If it is assumed that the synthetic oil can be marked at a competitive price, the whole pre-war structure of European and world oil trade would be disturbed by the sudden reversal of Germany's status from importer to large exporter. The European market would be subject to additional complications in the form of war-developed oil surpluses in Austria and Hungary. Of the oil-producing countries of Europe - Romania, Poland, Austria, Hungary Germany, and the USSR - only the USSR would be capable of exporting as much as five million tons of oil a year: the magnitude and direction of Soviet exports is not revelant, however, to the analysis of oil disarmament."

Section of Leuna Works at Merseburg Showing Bombs Effect on Piping System.

Thenania-Ossag, Refinery at Hamburg.



A member of the "working committee" which drafted the TIDC report pointed out to this reporter that synthetic oil could be marketed "at a competitive price", as outlined above, only if enormous subsidies were granted. As to USSR's ability to export "as much as five million tons of oil a year", he thought "may" was more appropriate than "would".

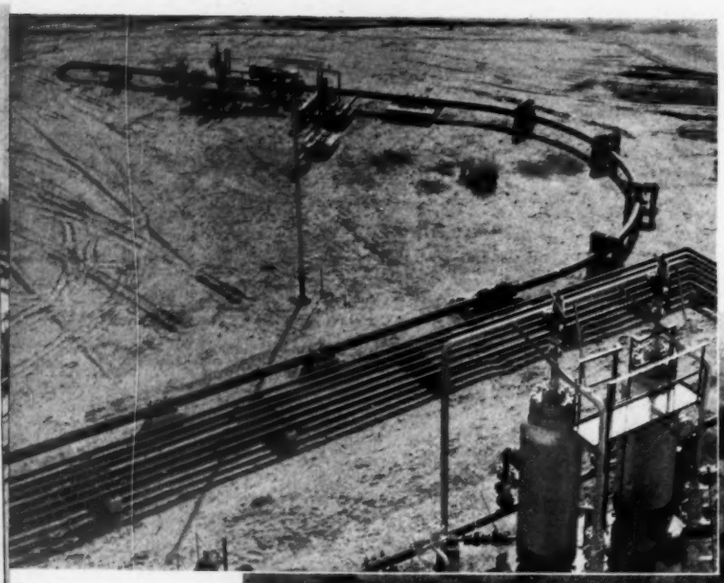
"Germany may be able to find a market for exports in Western Europe - France, Belgium. The Netherlands, Norway, Sweden, Denmark, Italy; such exports would be an important device for payment of reparations. From the security aspect it may be undesirable to make the western countries dependent upon Germany for their oil supplies. From the economic aspect, these countries would appear to offer an excellent outlet for German exports. It is, however, more than dubious whether the western European countries will be willing to accept German oil through outright purchase, creating German credits; they may, however, agree to receive such oil shipments as reparations, particularly in the early post-occupation years when overseas supplies and bunkers are inadequate.

"There is some question, however, as to whether the demand for finished petroleum products of the western European countries will be maintained at a sufficiently high level to absorb the annual 5.5 million tons surplus of German oil derivatives. The question arises whether France, Belgium, Holland and others will prefer to continue to pursue their pre-war policy of importing crude oil to support the domestic refining industry rather than importing finished products.

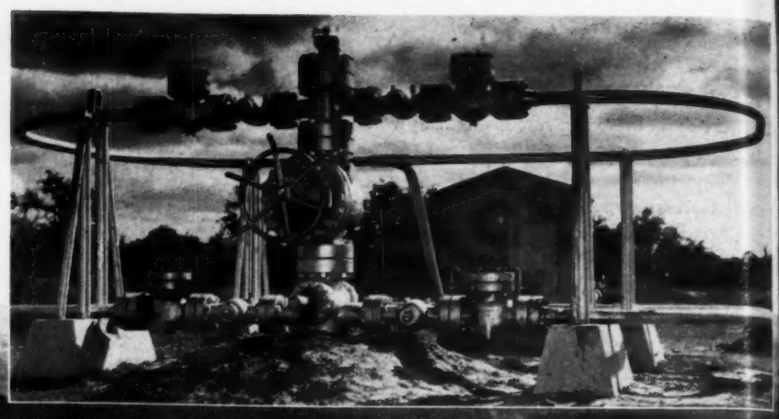
"It may be concluded that if German synthetic oil production is restored to the pre-raid level resulting in an explorable surplus of 5.5 million tons annually, Germany will be confronted by considerable difficulties in selling this quantity on the world market. Such an oil however, would constitute an important and valuable means for making reparation payments to the countries of western Europe if these countries were willing to accept it. Any assessment of the uneconomic character of the synthetic oil industry must be qualified by recognition of the significance of the output of the industry with respect to reparations. "If the finished products requirements of the western European countries were satisfied by reparation oil from Germany, a sizeable portion of the European market would be lost to potential suppliers throughout the world. No valid estimate of the quantities which would be lost by specific sellers can be drawn up, since the pre-war market structure and direction of trade has been basically altered during the war."

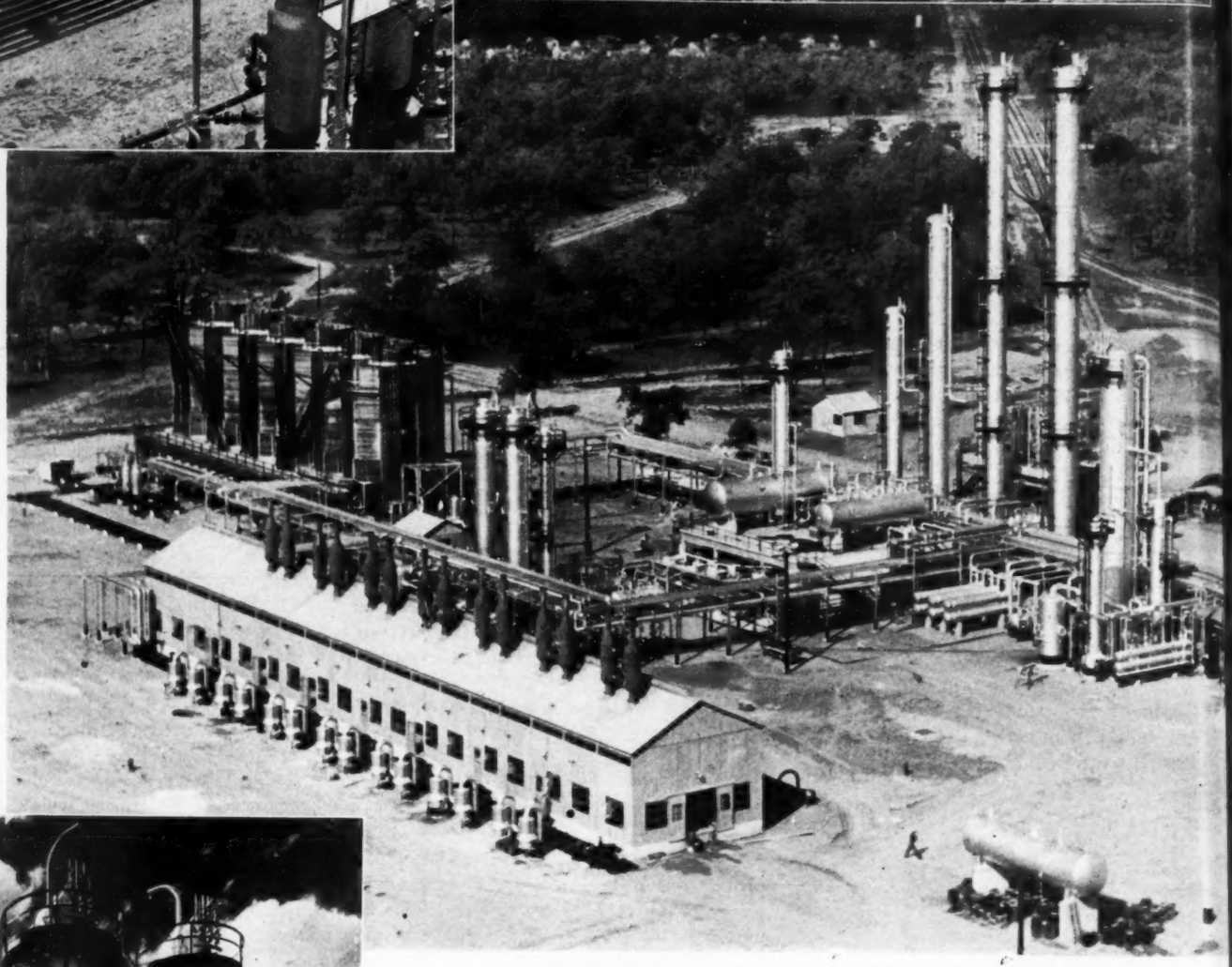
Allied interests constitute a large portion of the total investment in the German oil industry, the committee declared. American investments in German oil in 1938 were valued at over 88

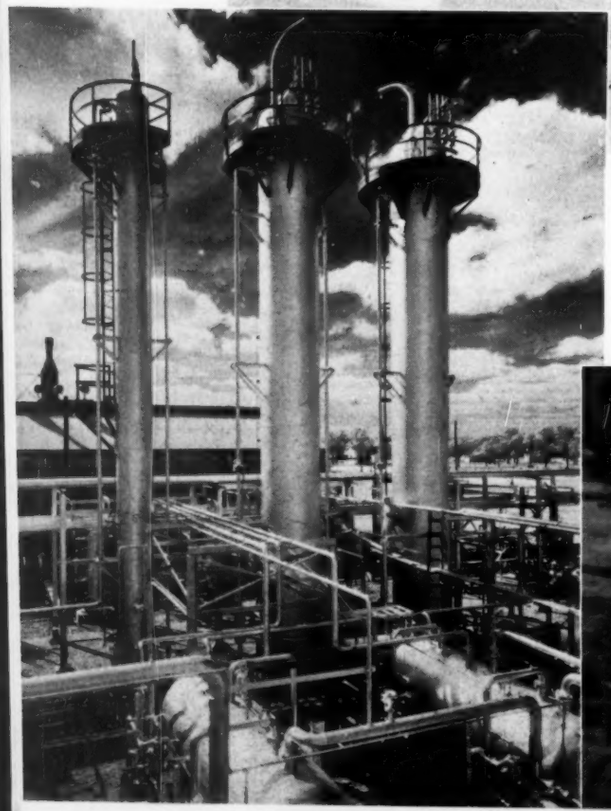
(*Continued on page 62*)



↑ Injection Line Curving to the Left is Equipped with Piston-Operated Plug Valves for Shutting Off Pressure Maintenance Gas to the Field or for Venting. Sliding Clamps at the Bend Allow Expansion. Inlet Scrubbers are shown at Lower Right.





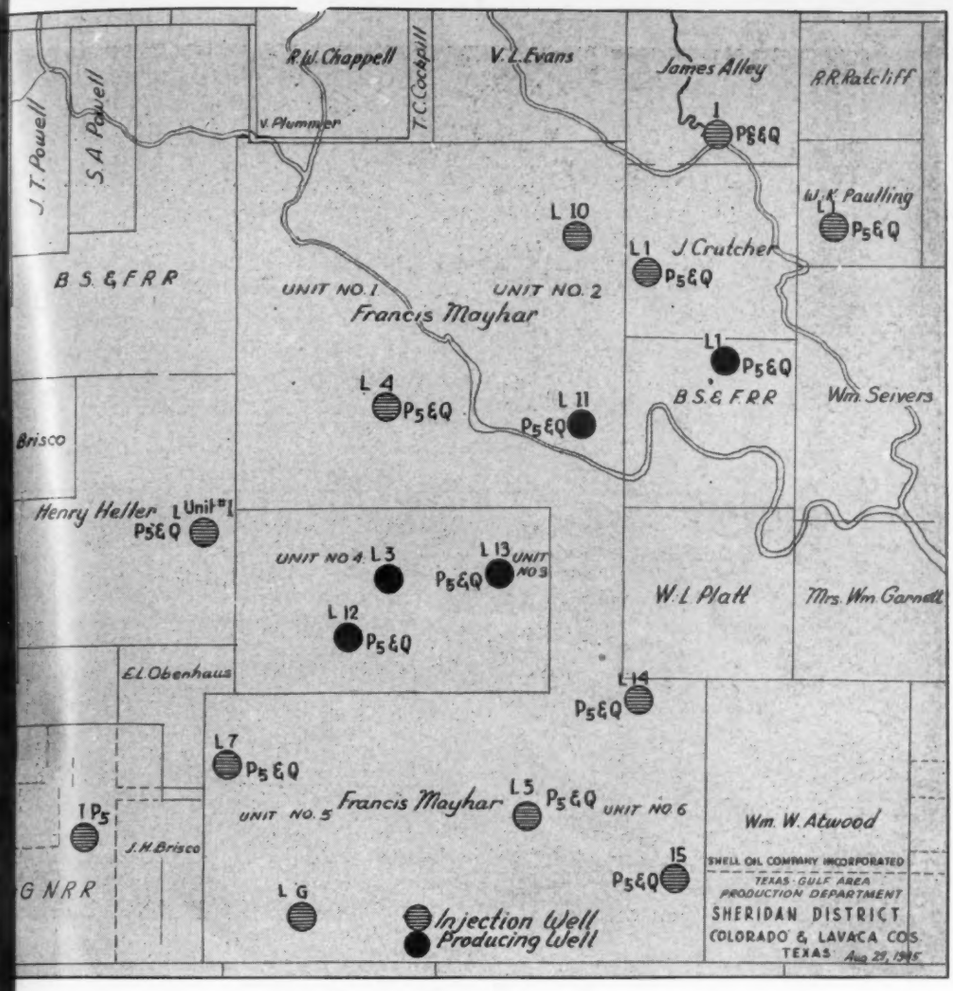


← Two 2,000-Pound Absorbers are Shown at Right. At Left is 500-pound reabsorber for Stripping Traces of Gasoline from Gas Vented in the Plant.

↑ Close-up Aerial View of Compressor Room, Cooling Towers and Fractionators. Camp for 55 Operations Employees and Families is in Background.

↑ Top of Page Above — Dual Completed Injection Well with Laterals for Injecting to Lower Zone Through Tubing and to Upper Zone Through Casing.

↓ Battery of Storage Tanks for Natural Gasoline, Normal and Isobutane.



↑ Stripping Towers—Natural Gasoline, Distillate and Mineral Seal Oil.

New Cycling Plant to Produce 6700 Barrels Daily

Shell Oil Company's First Venture Into Cycling Plant Operations Is With a 100,000,000 Cubic Foot Plant in Colorado County, Texas. Plant Is Handling Wet Gas From Two Horizons Proven For Production From 7500 Acres.

THE Shell Oil Company's new cycling plant at Sheridan in Colorado County, Texas, with a designed through-put of 100,000,000 cubic feet daily, has commenced operations. Ground was broken for this plant—Shell's first—on June 7, 1944, and partial production began early in August, 1945.

The plant obtains its supply from the Sheridan gas condensate field and is designed to extract from the "wet" gas 6,700 barrels daily of such products as commercially pure propane, isobutane, normal butane and isopentane, as well as natural gasoline and distillate.

Discovered in early 1941, the Sheridan gas condensate field produces by dual completions from a 9,300-foot and a 10,300-foot zone in the Wilcox series. The present proven acreage is about 7,500 acres. Currently the plant is using gas from 10 wells and injecting gas back to the producing zones in five wells.

Following is an analysis of the inlet gas to the Sheridan recycling plant:

	MOL%	MOLS/HR	LBS.HR
Methane	83.16	9,147.10	146,719
Ethane	6.73	740.00	22,252
Propane	3.85	424.60	18,721
Iso-Butane	.84	92.40	5,370
N. Butane	1.24	136.30	7,922
Iso-Pentane	.46	50.60	3,651
N. Pentane	.45	49.50	3,572
C_6 +	3.27	359.50	47,290
TOTAL	100.00	11,000.00	255,497

The plant is designed to operate at 1800 pounds pressure per square inch. It returns the dry gas to the formation at 4,000 pounds to maintain reservoir pressure, incidentally preserving a supply of gas for future use.

In the plant are seven 800 H.P. gas engine compressors, three 500 H.P. water tube boilers, and three 800 H.P. gas engine-driven generators.

The equipment also includes a 16-tray high-pressure absorber, a 20-tray reabsorber, a 27-tray still, a distillate stripper with 15 trays, a rectifier with 30 trays, a depropanizer with 36 trays, a debutanizer with 40 trays, a deisobutanizer with 70 trays, and a deisopentanizer with 70 trays.

The products manufactured, such as propane, isobutane and normal butane, together with natural gasoline and distillate are moving to market by tank cars, loaded at a 42-car rack.

Process design, engineering, drafting and construction of the complete plant were done in the Houston office of Petroleum Engineering, Inc. in accordance with Shell's specifications. Overall supervision of the project for Shell was under the direction of T. R. Goebel, and M. R. Church, manager and assistant manager, respectively, of the company's Gas-Gasoline Department for the Texas-Gulf area. J. T. Jordan, Shell process engineer, represented his company in process, design and operation of the plant.

New Period of Oil Refinery Construction Opening in 1946

IN normal pre-war years the refining division of the oil industry in the United States made new capital investments in plants costing about $150 millions. This was in addition to the expenditures for maintenance of existing equipment.

During the war the rate of investment in new facilities was approximately doubled and it was assumed in many quarters that post-war capital investment in refining equipment would drop to a very low figure. It generally was agreed that reconversion of refineries would be far simpler than in most manufacturing industries.

Scattered announcements of 1946 refinery construction projects in the United States already approximate a normal pre-war year and a considerable number of company programs now on the boards have not been made known. Management in some companies has been holding back announcements pending settlement of some of the outstanding current labor difficulties.

In addition to the domestic refinery construction work now in progress and to be undertaken this year there is a tremendous pent-up program in Canada, Latin America and other foreign countries. In the Western Hemisphere difficulties in completing scheduled construction work will involve only deliveries of equipment. In some other areas of the world construction work is temporarily delayed by unsettled political conditions and local disorders.

During the war and in the development period before Pearl Harbor catalytic cracking was economic only in very large units requiring an investment too great to be considered by smaller refiners. Result was that catalytic cracking has been exclusively a major company operation. In recent months, however, announcement has been made of the development of small units suitable for installation where crude runs are on the order of 2,000 barrels daily and charge stock availability may be as low as 1000 barrels per day. This materially modifies the earlier conception of catalytic cracking as being applicable only to plants running as much as 20,000 barrels of crude oil daily.

Out of the 394 oil refineries in the United States only 65 have a crude capacity of 20,000 barrels daily and higher. The former 20,000-barrel lower limit on catalytic crackers thus precluded use of the process in 83.5 percent of all plants. At the close of the war building program only 52 refineries in the United States were equipped to crack catalytically, although these plants represented 58 percent of the total refining capacity of the country. Outside the United States less than a dozen catalytic crackers are operating.

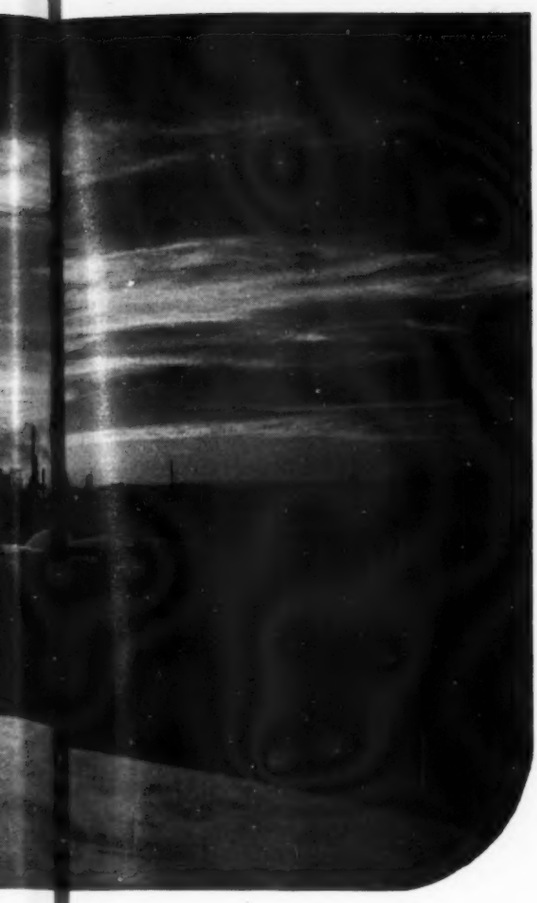
Development of the small catalytic cracking unit creates more than 200 new prospects for the use of this process in the United States. In other countries the proportion of refineries with a capacity of less than 20,000 barrels daily is even greater; consequently, the number of prospective catalytic cracking units for future installation will be relatively large.

First company to announce the installation of a small catalytic cracking unit is Leonard Refineries, Inc., at Alma, Mich. This plant will install a Thermofor catalytic cracking unit with a charging capacity of 3,000 barrels per day. Leonard has been operating two small refineries within a few miles of each other until recently. One plant was at Alma and the other at St. Louis. In recent months the St. Louis plant has been dismantled and moved to Alma. Combined capacity of the two before the recent move was 7,000 barrels daily. Both plants were equipped with small thermal cracking units.

In recent weeks Wallace Gilroy and associates have purchased the National Refining Company's 9,300-barrel refinery at Findlay, Ohio, and will operate the National property in conjunction with those of Mid-West Refineries, Inc., which operates refineries at Grandville and Alma, Michigan. The Grandville plant has a capacity of 4,500 barrels daily and the Alma plant 3,500 barrels daily. At the time of the consolidation it was announced that a modern catalytic cracking plant would be built. It was not stated whether the new plant was to be erected at the Ohio site or at one of the Michigan locations. All three are equipped now with thermal units.

Assuming that the historic trend in octane number of motor gasoline continues in the future it seems likely that competitive conditions may force small refiners to build catalytic crackers whether they want to or not. Before the war the average octane rating of house-brand gasoline was rising at the rate of about one number per year. While it is too soon after V-J Day for specifications to reach a settled basis there are plenty of indications that the octane rating is going to continue rising. There is plenty of gasoline available and sellers are out after business. They are using quality as a selling tool as in the past. As long as competition is as keen as it is today octane numbers will rise faster than the requirements of automotive engines.

The Texas Company recently announced that it will build a catalytic cracking unit costing about $4.5 millions at its Casper, Wyoming, refinery. The cracking unit will be supplemented with a new crude still and vacuum unit for the production of road oils and other asphalt products at



well as charging stock for the catalytic unit. Cost of these auxiliaries will be about $1.5 millions bringing the total new investment by Texas at its Casper plant to $6 millions.

Standard Oil Company of California announced recently that it will spend $33 millions on construction and in the purchase of needed facilities. Of this sum $13 millions will be spent for shipping and $15 millions for oil refining equipment. Most of the oil refining investment will be made at the Richmond and El Segundo plants. Details of the construction program have not been announced aside from the $2 millions earmarked for research buildings and equipment and $1 million for an asphalt plant.

This new asphalt refinery will be located at Willbridge, Oregon, near Portland. This plant will cost about $1,000,000. Crude will be supplied by tanker. In the vicinity of the Standard plant, Shell Oil Co., Inc., will erect a similar refinery but of somewhat smaller capacity.

Shell Oil Company, Inc. is spending $15 millions at its Houston refinery alone and an additional $1 million for research facilities in exploration and production. Construction programs at other Shell refineries notably in Illinois and California have not been announced as yet.

The new catalytic cracking plant at Shell's Houston refinery will be the largest in Texas. Built at a cost of $11 millions this unit will have a throughput capacity in excess of 25,000 barrels daily. In addition to motor fuels the plant will produce special cuts of C_3 and C_4 hydrocarbons for chemical synthesis. Special high pressure absorption facilities are being installed to recover gases for alkylation and chemical intermediates. This plant will employ a new micro-spheroidal synthetic catalyst manufactured under techniques developed by Shell. The plant will be completed about the middle of 1946.

Capacity of the Shell power generating equipment at Houston is being increased from 5,000 to 25,000 kilowatts to meet current and anticipated refinery expansion. The installation consists of two 10,000-KW non-condensing turbine generators, three integral furnace boilers and a 625,000 pound-per-hour water treater. Exhaust steam from the turbines will be used to augment refinery process steam. The power program will cost $4 millions and will be in operation early in 1947.

One of the most notable refinery construction projects currently in progress in the United States is that of the Standard Oil Company of Indiana. The Indiana company initiated plans for expansion and modernization immediately after V-J Day and today the program is getting well under way. Outstanding in the Indiana program is the construction of 60,000 barrels of Catalytic cracking capacity. Three 20,000-barrel units are to be built, one at Sugar Creek, Mo., and two at Whiting, Ind.

In addition to the cracking unit at Sugar Creek the new construction will include a vapor recovery unit, a polymerization unit and a steam generating plant. At Whiting the program includes two vapor recovery units, conversion of a thermal combination unit to a crude and coking still, construction of a steam-electric plant with two 1,200-pound boilers, and lubricating oil refining facilities.

While Canada's refining facilities were greatly expanded during the war years a further important addition will be made in 1946. This will take the form of an enlargement of the Montreal refinery of Imperial Oil Ltd. which will include the addition of a fluid catalytic cracking plant, a new crude unit and a gas polymerization plant. Engineering plans for the new installation are now being completed and construction work is expected to start as soon as preliminaries are finished.

During the war refinery construction was centered on the production of maximum quantities of aviation gasoline or 80 all-purpose gasoline. Virtually no building was done of new lubricating oil plants. The lapse of four years has put refiners far behind with normal replacement of obsolete or worn-out lube plants. Normal increase in still capacity has not been provided.

Now that the war is over almost every large refiner is planning the installation of new lubricating oil facilities. Principal refinery construction firms currently are being asked for bids on several large solvent extraction and dewaxing units. Several such units will be built on the Gulf Coast, in the Middle West and on the Atlantic seaboard. Several lube plants which have been completely designed, or nearly so, have not been announced because of current uncertainties regarding availability of steel.

Included in the Standard of Indiana building program at Whiting previously mentioned will be a propane dewaxing plant, solvent extraction unit and clay contacting and vacuum distillation facilities.

Atlantic Refining Company will build additional lubricating oil processing and microcrystaline wax manufacturing equipment in 1946. Included will be a propane deasphalting plant with a charge capacity of 4,300 barrels per day, an M.E.K. dewaxing and deoiling plant with a capacity of 3,850 barrels daily and a solvent extraction unit to handle 2,400 barrels daily.

Mexican Petroleum Corporation is increasing its crude capacity 20 percent to 5,500 barrels daily at Savannah, Ga. Additions are being made to the plant's storage capacity by the erection of one 80,000-barrel tank and a number of smaller tanks. Mexican Petroleum is the largest producer of asphalt in the southeastern states.

Another southern asphalt plant now is being erected at Tuscaloosa, Ala., by the Hunt Oil Company. Crude will be barged up the Black Warrior to the new plant from Choctaw County where the Hunt interests have developed a large reserve of asphaltic base oil.

Probably the most significant innovation in refining facilities in the United States to be made in 1946 will be the large plant to be erected in the Carthage field in Texas for the production of gasoline from natural gas. While the method to be employed is loosely referred to in the trade as the Fischer Tropsch process it actually will represent a great advance in engineering efficiency over any of the plants built in Germany embodying this process. While detailed plans for the plant have not been announced it will be a plant of large capacity and will represent an investment of many millions. Engineering plans are in the hands of Hydrocarbon Research Inc. and construction will begin as soon as the details of company organization are completed. Successful operation of this plan undoubtedly will lead to the erection of many others and will add appreciably to the resources applicable to the nation's gasoline supply.

World War II has had two diametrically opposite effects on the petroleum refining industry. It was responsible for the greatest achievement in mass plant construction ever accomplished within a like period of time. This was motivated by the realization which became more widely accepted as the conflict continued that oil and the machines powered by oil would prove the decisive

factor in the struggle. To provide an overwhelming superiority in offensive and defensive strength new processes were brought into operation and hundreds of new plants were erected to provide special products for military use. With a few notable exceptions these plants were located within the United States and their vital contribution to final victory has been acclaimed.

In view of the strategic importance of oil, however, a primary objective of both sides in the war was to destroy enemy facilities for the output of petroleum products. Refineries thus became preferred targets of attack and the systematic bombing of Axis controlled oil installations proved to be a chief factor in bringing first the Nazis and then the Japanese to the point of surrender.

How effective this campaign proved to be has been revealed since the close of the war by records obtained from enemy hands. These show in the case of Germany that as the tempo of Allied air attack steadily rose the output of German synthetic plants fell from 625,000 tons in early 1944 to 4,000 tons in March 1945 and to the complete suspension of aviation fuel production in the following month. Meanwhile the carrying out of air attacks on outside sources of German oil supply in Romania and occupied countries had almost completely shut off such supplies. Similarly bombing attacks on Japanese controlled oil plants in the Pacific virtually grounded the Nipponese air force and neutralized the Nipponese fleet. In this process of liquidating the Axis oil industry 80 percent of the refining capacity of Europe was badly crippled or wholly destroyed. In the Pacific great plants in Java, Sumatra, Borneo and Burma met a similar fate. Replacement or reconstruction of nearly one hundred war damaged plants is a task that is comparable with the entire wartime refinery construction program. Added to this is the rehabilitation of existing plants for which it has been impossible to obtain needed replacements during the past five years and the building of new establishments to process the increased production that has been developed in different parts of the world. In the aggregate the accumulated demand for refinery equipment will tax the capacity of manufacturers for years to come.

Typical of conditions that prevail in many countries is Mexico. Since the government took over the operation of the oil industry in 1938 little has been done to improve refining facilities with the result that refineries are obsolete and are no longer capable of turning out products sufficient to meet the rapidly rising requirements of domestic consumption. Plans for the complete rehabilitation of the Mexican refining industry at a cost of $50,000,000 or more have been prepared by Petroleos Mexicanos, the government operating company. First step in the execution of the program is well advanced with the reconstruction of the refinery at Atzcaputzalco, a suburb of Mexico City, which is expected to be completed during the current year. New installations at this refinery include a 100 octane unit and will process 40,000 to 50,000 barrels of crude daily. Other plants are to be erected at points which will facilitate the distribution of products to the interior of the country. One of these is to be located in San Luis Potosi and others may be established on the western coast and possibly at Monterrey if exploratory drilling now being conducted in Northeastern Mexico develops sufficient production to justify its erection. Existing plants at Tampico and Minatitlan will be modernized to put the whole processing equipment in efficient operating condition.

In South America the most ambitious program of refinery construction is that of Venezuela which has been described in previous issues of World Petroleum. It includes the erection of at least four large plants with a combined daily capacity of over 150,000 barrels. One of these to be built by Cia. Consolidada de Petroles, subsidiary of Sinclair Oil Company at Puerto Cruz, terminus of the company's pipeline from its Santa Barbara field, will have a daily throughput of 35,000 barrels. Another, at the same location, is to be erected by Mene Grande Oil Company, a subsidiary of Gulf Oil Corporation, under its agreement with the Venezuelan government. This agreement calls for a plant of 20,000 barrels capacity to be completed by January 1, 1951.

Creole Petroleum Company, affiliate of Standard Oil Company (N.J.), has begun work on the site of a refinery city at Turiamo on the northern coastline of Venezuela. The plant will incorporate the most modern equipment and will have a daily capacity of 50,000 barrels. The project calls for an investment of roundly $50,000,000. Another development of like proportions is that of the Shell subsidiary, Caribbean Petroleum Company on the Paraguayana peninsula, east of the Gulf of Maracaibo. The plant, estimated to cost between $35,000,000 and $40,000,000, will have a daily throughput of 40,000 barrels. Aside from the refinery itself a complete town will be constructed with housing for employes, health and recreational facilities and an extensive terminal for loading and unloading vessels.

Argentina is another South American country which feels the need of additional refining facilities. Yacimientos Petroliferas Fiscales, the government controlled oil company, plans to erect two additional plants to handle its crude production which is now above the capacity of its existing refineries and to improve its facilities for the distribution of products to the interior of the country. Re-equipment of its present refineries also figures in the program.

Construction of a modern plant at Sucre, Bolivia, will serve to modernize the refining facilities of that country which are now confined to topping plants at Camiri and Sanandita. The refinery will be equipped to produce gasoline, kerosene and fuel oil and will process 5,000 barrels of crude daily. Its estimated cost is $10,000,000. Its crude supply will be drawn from the Camiri field and will be transported by a pipeline 250 miles long which will be the highest in the world, traversing a mountain range nearly 10,000 feet in height. The cost of the pipeline with necessary pumping stations will be approximately $5,000,000. Various proposals have been under consideration for enlarging refining capacity in Brazil. One such, recently approved by the National Petroleum Council, is the construction of a distillation unit by Companhia Brasileira at Rio Grande. Numerous reports have appeared from time to time of projected refinery expansion in Latin American countries including a forecast that two additional plants would be established in Colombia. In these cases it appears, however, that construction will have to wait on an increase of production in the areas referred to.

On the other side of the world, in the Middle East, a great expansion of refining facilities took place during the war. Because of their importance in providing products for use in military operations in that active theatre priorities were granted on materials for the construction of these plants. Among these undertakings the most noteworthy was the enlargement of the Abadan refinery of Anglo-Iranian Oil Co. Ltd. which is now the largest in the world with a daily throughout capacity of over 375,000 barrels. On Bahrein Island a refinery of 65,000 barrel capacity was constructed by Bahrein Petroleum Co. Ltd. and on the eastern coast of the main Arabian peninsula Arabian-American Oil Company has erected a plant of 50,000 barrel capacity. Meanwhile, additions to Consolidated Refineries at Haifa on the eastern shore of the Mediterranean bring the total capacity of Mid-Eastern plants to over 600,000 barrels daily.

These important developments, however do not exhaust the prospects for early refinery expansion in this area. In connection with the enlargement of the Iraq Petroleum Company's pipe line which will more than double its former capacity two American companies - Socony Vacuum and Standard Oil Co. (N.J.) have obtained concessions for the location of refineries near Tripoli, the Mediterranean terminus of the northerly branch of the pipeline, though no date has been set for the construction of these plants. Arabian-American, through a subsidiary, Trans Arabian Pipe Line Co., has obtained concessions for the building of a diameter line from the Persian Gulf to the eastern shore of the Mediterranean which may lead to the erection of a refinery at the latter terminus.

In quite another part of the Eastern Hemisphere but in a market that is of particular interest to Middle East and Far East producers it was recently reported that a refinery would be built in Australia as a joint enterprise of the California Texas Oil Company and Australian interests. On a huge task of restoring or replacing refineries damaged or destroyed during the course of the

(*Continued on page 66*)

Motor Voltage Considerations in Oil Refineries

By E. Kun The Lummus Company

The selection of voltages for motors in oil refineries and similar industries plants is commonly determined in accordance with rules and practices established for a number of years, and not on the basis of economy as affected by the latest developments in the arts and with consideration to supply system requirements.

Three-phase motors for 440 volt and 2200 volt service are the types most frequently used, with a dividing line varying between 50 and 100 HP with the different industrial plants. The reason for going to 2200 volts for 100, 75,60 and even 50 HP motors is clamed to be a saving in cables and conduit for the motor circuit, and a saving of transformer capacity when the usual 2300 volt distribution system is available. In former times when 2200 volt motor control equipment of standard type (NEMA - I enclosures), and low interruping capacity could be used, a saving could be obtained by applying the higher voltage to motors of sizes under consideration.

Today, however, due to the more or less universal requirements of the so-called "explosion-proof" (Underwriters' Class I, Group D type) control equipment, and the electrical system, the use of the higher voltage, for sizes of motors up to and somewhat above 100 HP, usually results in a waste of money and space for control equipment.

The purpose of this article is to determine the practical limitation of motor sizes for the economical application of voltages. The following tables contain approximate costs of material which are representive figures for motors, control equipment and wiring in oil refineries, where "Class I, Group D", type equipment must be used. These figures should suffice for comparison, as labor costs are about proportional to costs of material.

Comparison of Tables I and II indicates that motors of sizes up to and including 125 HP should definitely be for 440 volt service. In case of 150 HP motors the figures indicate a slight saving in favor of the 2200 volt motor. However, it must be remembered that the cost of motor feeders, incoming line equipment and other factors varies with local conditions, and the figures may vary slightly in favor of either voltage. The deciding factor should be, in this case, the higher maintenance of the high voltage control equipment, for which reason 440 volt equipment will prove more economical in the end, for 150 HP motors; 2200 volts should be selected for 200 HP and above, with equipment such as included in the above tables.

There are two other types of 2200 volt control equipment very often used in oil refineries. One is of switchboard panel construction, employing a low interrupting type oil immersed contactor with a set of high interrupting capacity type, current limiting fuses in disconnecting mounts. The cost of such equipment for semi-hazardous locations is approximately $1650. list (including controller, disconnecting device, bus and interconnections) and, therefore, the above conclusions should also apply when such equipment is considered.

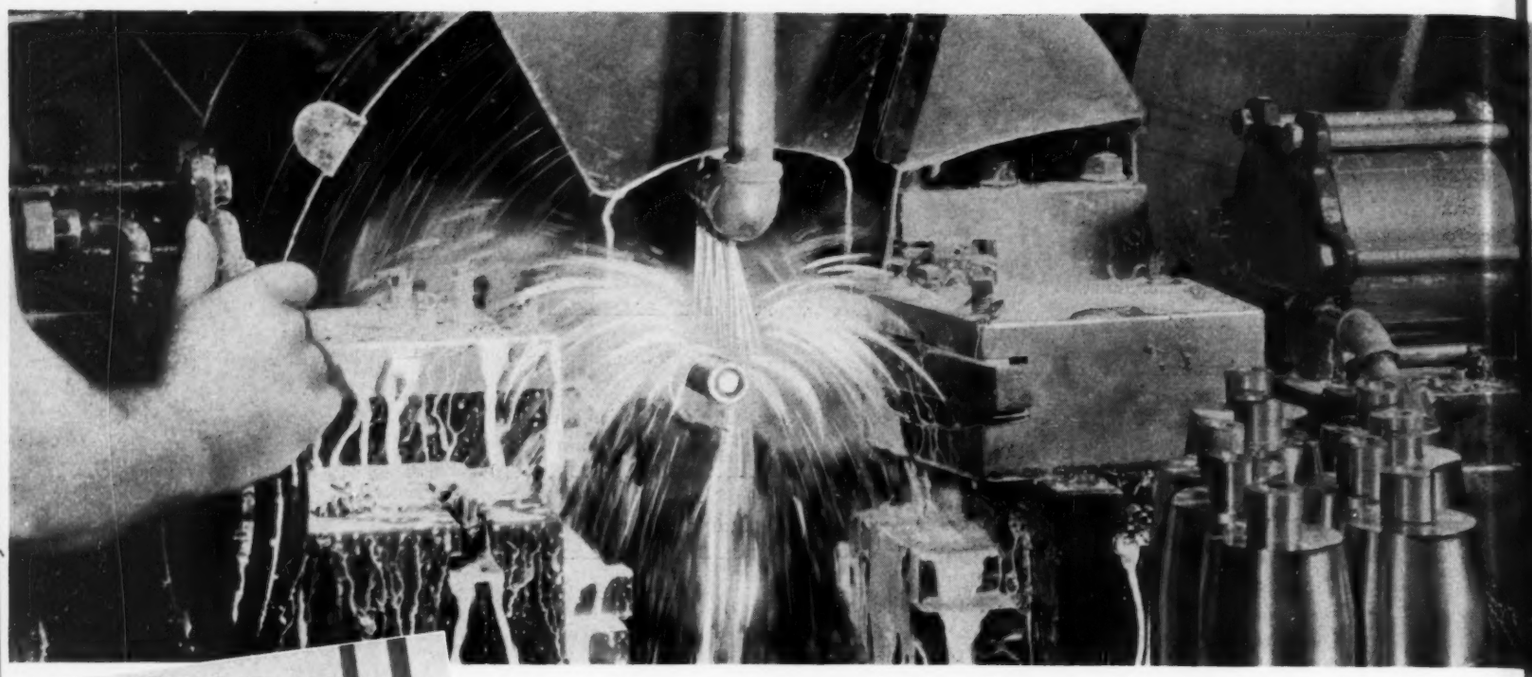
TABLE I
440 Volt Equipment

Horsepower	60	75	100	125	150	200
Motor, 440 volt, 3-phase, 60 cycle, 1800 RPM, squirrel-cage, explosion-proof	$851	986	1294	1660	1923	2456
Controller, 440 volt, combination type, oil immersed magnetic, across-line, with circuit breaker, Class I, Group D, construction, including explosion-proof push button station mounted at motor	410	410	410	850	850	850
440 volt enclosed bus and inter-connections at controller assembly	53	57	64	108	112	135
Motor feeder (varnished cambric insulated, lead covered cables) also push button pilot cable, including conduits and fittings for both, based on 100 ft. length	184	225	273	387	438	550
Estimated share of main 440 volt circuit breaker, and incoming service feeder	150	190	250	315	375	500
Estimated share of 2400/480 volt transformer station	240	300	400	500	600	800
Total of all items	$1888	2168	2691	3820	4298	5291

TABLE II
2200 Volt Equipment

Horsepower						
Motor, 2200 volt, 3-phase, 60 cycle, 1800 RPM, squirrel-cage, explosion-proof	$972	1107	1385	1746	2005	2514
Controller, 2200 volt, oil immersed, magnetic, across-line, with 50,000 KVA interrupting rating Class I, Group D construction, including explosion-proof push button station mounted at motor	1340	1340	1340	1340	1340	1340
Disconnecting switch, 3-pole, oil immersed, 5 KV or 7.5 KV rated	205	205	205	205	205	205
2200 volt bus and interconnections at controller assembly	160	160	160	160	160	165
Motor feeder, (varnished cambric insulated, lead covered cables) also push button pilot cable, including conduits and fittings for both, based on 100 ft. length	195	195	195	195	195	235
Estimated share of main 2200 volt incoming line panel and incoming service feeder	250	250	300	300	300	350
Total of all items	$3122	3257	3585	3946	4205	4809

(Continued on page 70)



† The laboratories have made extensive studies of cutting and grinding oils, the use of which is illustrated above.

Research Takes Commanding Pla

By Dr. O. W. Willcox

As a Result of Progress Already Made and New Possibilities Opened by Recent Developments the Oil Industry is Expending Hundreds of Millions in Learning More About its Basic Materials and Discovering New Applications to Broaden Their Field of Usefulness — Socony-Vacuum's Laboratories Employ More Than 800 Technicians and Carry on Hundreds of Complex Operations in the Search for More Process Products.

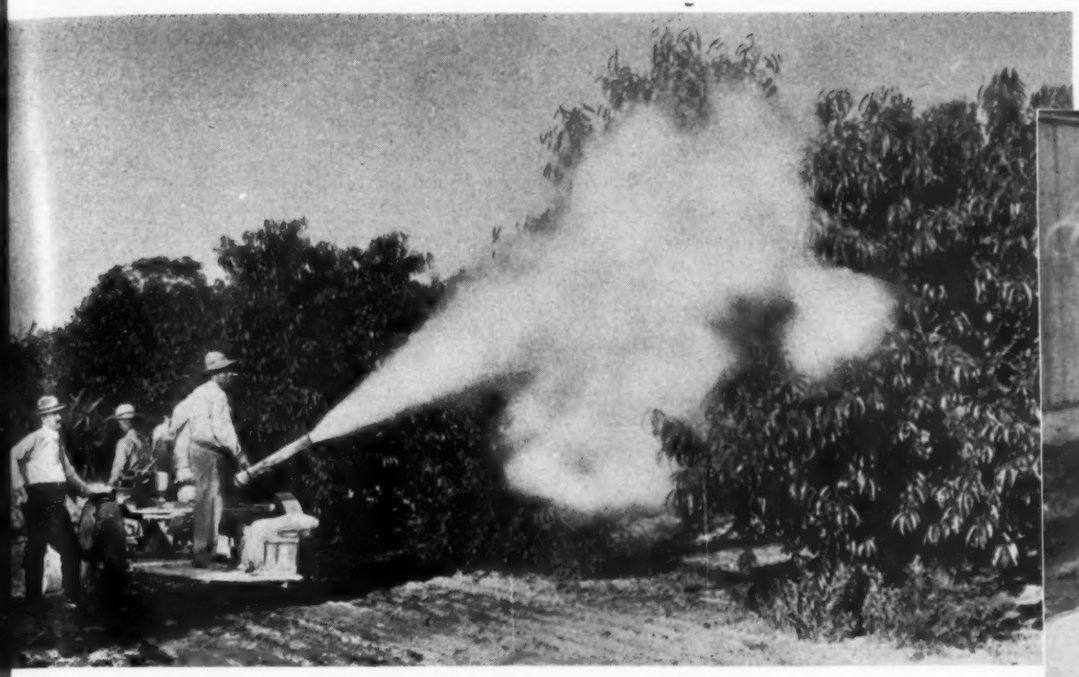
† Dr. R. M. Koppenhoeffer Testing a Special Oil That Increases Wear of Sole Leather 25 Percent.

THE "know-how" acquired in the preparation of petroleum products for military and other essential wartime uses is now being employed in the improvement of civilian products. This knowledge includes not only the advances made in the manufacture of high octane aviation gasolines but also in the development of petroleum chemistry that resulted in hundreds of special fuels, lubricants, greases and protective coatings needed to fight the global war.

As a result of these advancements it will be possible to manufacture superior fuels for peacetime aircraft and motor cars as well as improved heating oils, lubricants, additives and by-products to be used in the manufacture of textiles, leather, paints, solvents, pharmaceuticals, dye stuffs, plastics, and other products for improving the American way of life.

At present, more than thirty basic industries use petroleum in their manufacturing processes, and the individual applications are numbered in the thousands. If one looks around, there will be found very few articles of common use, in the manufacture of which a petroleum product was not used at some stage of the process. The clothes and the shoes one wears, the furniture one sits on, the paper one sees, and a host of other common everyday articles either contain a petroleum product or one on which a petroleum product was used while it was being made. And the end is not in sight. The petroleum refinery as a chemical factory is just now getting into its stride. Important new uses for petroleum are continually being discovered; more and more crude oil is being converted into products other than fuels, lubricants and synthetic rubber. The latter will be important items of the oil business for a long time to come, but already millions of barrels a year are going into subsidiary products, the output of which is growing at an increasing rate, and a substantial portion of the refining industry's revenue is and in future will be derived from this source.

The modern petroleum refiner has attained his present position because he has applied scientific research to his materials, and it may be said that the contributions of the petroleum industry to civilization's necessities and conveniences have increased more or less in direct proportion to the use that has been made of the creative talents of chemists, physicists and engineers. Long ago it became apparent that every oil company which expects to keep abreast, if not in advance, of the march of progress must provide itself with a place where new ideas may be born and nurtured into usefulness, and so it has come about that every major oil company has a refinery research department on which every year it lavishes hundreds of thousands, and in some cases, millions of dollars in salaries, equipment and facilities.



↑ Oil Sprays are Extensively Used in Combating Orchard Pests and Improving the Quality of Fruit.

Oil Company Operations

The laboratories of Socony-Vacuum Oil Company illustrate the significance attached to scientific study and experimentation by a great international organization with a business extending to every part of the world. They comprise two separate but closely coordinated divisions. One is the Research and Development Laboratories occupying eighteen buildings at Paulsboro, N. J., the function of which is to concentrate on long-range research problems and developments; and the Technical Service Laboratories located in five buildings in Brooklyn, which are primarily concerned in turning new developments into practical products and serving the day-to-day technical needs of the company. W. M. Holaday and a staff of assistants in Socony Vacuum headquarters at historic 26 Broadway, New York, supervise the activities of both groups which number over 800 persons.

In a broad sense the main pursuit of the Research and Development Laboratories is the hunt for new possibilities which may be hitherto unknown uses for petroleum products, or an improvement on previously established methods and products; these latter often turn out to be as revolutionary as an original discovery if not more so. It was so in the development of catalytic cracking, which has been of tremendous importance for aviation and other automobile purposes. Socony-Vacuum was the first to take up Houdry's original conception and to develop it into a powerful refining tool.

The main contribution of the Paulsboro laboratory to the science and practice of catalytic cracking has been the development of the Thermofor Catalytic Cracking process (TCC). Other catalytic procedures have appeared in other quarters, notably the Fluid Catalytic Cracking process, which has made use of highly original methods and immense pieces of equipment. This is not the place to make a comparison of these two processes; both have contributed enormously to the task of supplying the armed forces of the United States with gasolines and other products of the highest quality. At present there are 34 TCC units in operation, and these, together with the original fixed-bed Houdry units installed have been credited with the production of a great part of the gasoline that has been made catalytically.

At the Paulsboro laboratories, research on petroleum catalysis is far from being a closed book. Here there is a whole specially designed building equipped with refining units of pilot-plant size with which a group of 30 engineers and technicians are making continual tests on new methods of catalytic processing. At the same time another group of specialists is continually busy in the creation and study of new catalytic materials. Here much progress has been made; there is a wide difference between the crude natural clay catalyst first used by Houdry and the remarkable "bead catalyst" that easily flows in solid streams down the tall TCC colums. This study of the fundamentals of petroleum catalysis has been prosecuted at Paulsboro for five years; hundreds of catalysts have been synthesized and tested, and the search for a still better one goes on. The bead catalyst now going into new TCC commercial units is produced in a new plant costing $2,600,000; it produces

↑ Weeds are Easily Killed by Petroleum Derivatives Which do not Impair the Fertility of the Soil.

the transparent beads at the rate of 1,000,000 or more a minute. Although these beads are vastly larger than the microscopic dust particles used in fluid catalytic cracking they are full of microscopic pores that present an equivalent reacting surface.

The function of catalytic cracking is to produce blending bases for compounding super-fuels. The work of the Paulsboro group which is investigating new catalysts, and of the group that is using the new catalysts to produce new and better fuel bases, is carried foward by another group which is looking foward to the application of the new fuels in the post-war world. To this end the motor laboratories at Brooklyn and Paulsboro are provided with automotive engines of all designs and sizes which are in constant operation. Especially promising fuels are submitted to as many as 100 different tests to determine all their characteristics. The program of the motor laboratories includes investigative work on diesel fuels; for this purpose the laboratories possess engines representative of most of the popular makes of diesels of all sizes up to giants of the type used on streamlined trains.

Some of these tests run as long as 1000 hours. The results of the tests are used as indications for improvements in the production of diesel fuels—better cetane number, for example.

Alongside the group of motor specialists at Paulsboro is a group of fuel specialists whose objective is to obtain larger volumes of distillate fuels for domestic use from available stocks. The results of their studies are relayed back to the refinery operators who have been enabled to produce new TCC domestic fuels with more heat content per gallon and more freedom from gum, sludge and sediment. On the other hand, the catalytic processes are being studied to produce less but better heavy fuel oil.

Of equal importance with the production of first class engine fuels is the production of first class lubricants; in fact, recent developments of automotive and aircraft engines have placed great responsibility on lubricating oil research. Socony Vacuum's General Laboratories are meeting this responsibility with new refining techniques, new addition agents, and new engine test procedures and facilities. The Paulsboro pilot plant, having perfected the Clearosol process for refining lube oils, is now going on to develop new techniques. This work is of such magnitude and importance that arrangements are being made for building still another laboratory costing $500,000 to be devoted exclusively to this field. The program for lubricant testing includes 75 different standard procedures; for the practical tests, use is made of the many automotive and aircraft engines at the disposal of the Laboratories.

Alongside the group of specialists engaged in the production of new lubricant bases Paulsboro has another group of 30 organic chemists who devote their entire time to the production of additives or addition agents. These additives are remarkable substances that confer upon petroleum products various properties that the original constituents of petroleum do not possess, or possess them to an insufficient degree; or it may be said that additives are used to give oils certain specific properties. The 30 organic chemists referred to have been working on this problem for a long time at Paulsboro; they have created and tested thousands of such compounds. It should be stated that other major oil companies besides Socony Vacuum also have great research laboratories, where research on additives and all other aspects of petroleum refining research is carried out on a large scale, but the Paulsboro Laboratories have a number of important "firsts" on their "additive record". In the early 30's they produced additives for lowering the cold-point or pour-point of lube oils to make them more usable in cold weather; in the mid-30's they produced outstanding oxidation inhibitors to preserve the lubricant from oxidation, and extreme-pressure agents for all-purpose gear oils; more recently they have produced oiliness agents to give the lubes more lubricity and powerful detergents to keep engine interiors clean. As one outcome of this activity The Socony-Vacuum Research Laboratories succeeded in meeting the Army's demand for a single oil for all ground vehicles. The product was the Delvac 900 oil, which contains both oxidation inhibitors and detergents that have kept engines running under exceptionally severe conditions. An outstanding new additive for aircraft engine oils—which hitherto have been limited to straight mineral oils—is in process of development.

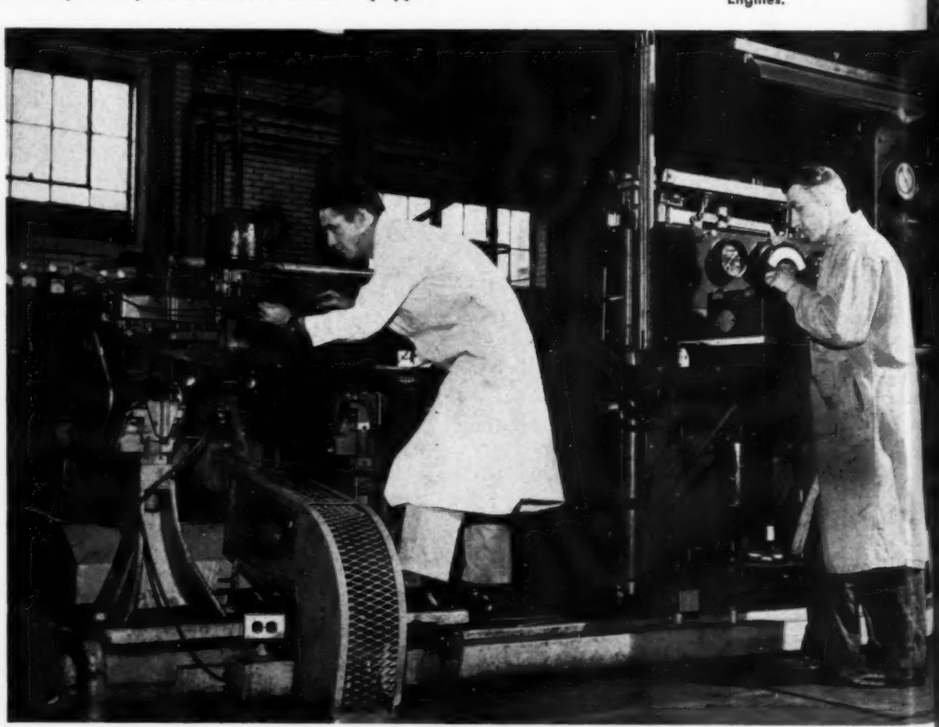
Mechanical engineering has recently developed a new means of power transmission—the hydraulic drive. This development called for study to produce oils suitable for this kind of use. Sometime ago Socony Vacuum developed a satisfactory product, for which the General Laboratories invented some unique refining techniques and found an additive capable of controlling deterioration up to a temperature of 400°F. The Socony-Vacuum researchers see a vastly expanded market in the field of additive agents. This prospect appears to be so immediate that over half of all the test engines in the motor laboratories are working night and day in evaluating new motor and aircraft oils reinforced with new oxidation inhibitors and detergents.

In fact, the discovery that the properties of the lube oil fractions coming from refinery columns may be greatly enhanced in respect of chemical stability, viscosity, fluidity, film strength and lessened susceptibility to temperature effects by the choice of a suitable additive, has led to the production of industrial oils for many other special purposes. The Socony-Vacuum Gargoyle DTE Turbine oils are an example. During the development of this line, specialists in the turbine oil laboratories at Paulsboro prepared scores of special mineral stocks and several hundreds of addition agents All these new products had to be subjected in the Laboratories to exhaustive test runs. Another unique special laboratory set up at Paulsboro is one equipped as a circulating oil laboratory wherein specialists study the lubricating problems that have come with reduced clearances, increased loads and higher operating temperatures under conditions identical with those in industry. The new Vacuoline oils were developed in this laboratory.

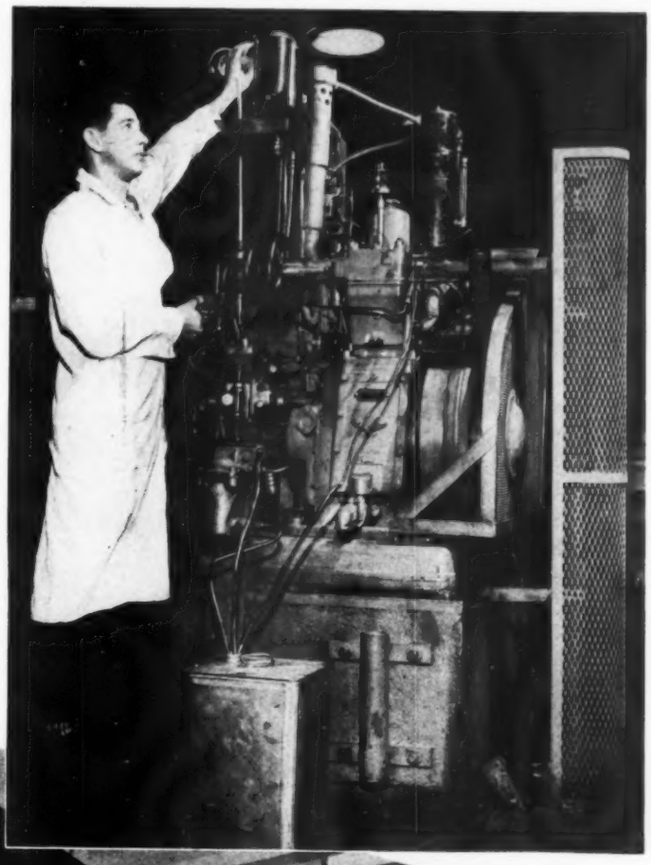
The Socony-Vacuum laboratories, besides special laboratories for the investigation of large general problems like those presented by engine fuels, engine oils and lubricants, has a large "industrial laboratory" which is full of special set-ups brought in to solve special problems. To this laboratory come requests for help in a great number of problems involving the use of machinery oils. For instance, in the development of the Velocite oils for the spindles of textile factories, a set-up comprising a battery of spindles was installed and instrumentation was provided for registering the efficiency of experimental oils until the right kind of product was decided on. Other special set-ups comprised gear machines for evaluating gear oils, carbonization units for studying carbonization in steam cylinder lubrication, and other industrial tools. Altogether, there is an average of 50 such set-ups in the laboratory all the time.

There are still other special laboratories. One is a unique cutting oil laboratory which is staffed with specialists and provided with facilities that, to quote a spokesman for Socony-Vacuum, "are unparalleled in the industry". The function of this laboratory is to provide and test oils that are especially designed for use in machine shops for facilitating the operations of lathes, threading machines, tapping machines. Proper oils for these operations are of great importance in a machine shop and the need for them became great when the war demanded the utmost in

↓ Vincent Malone and Rudolph Seidl, Former Service Men, Testing Lubricants for Automotive Engines.

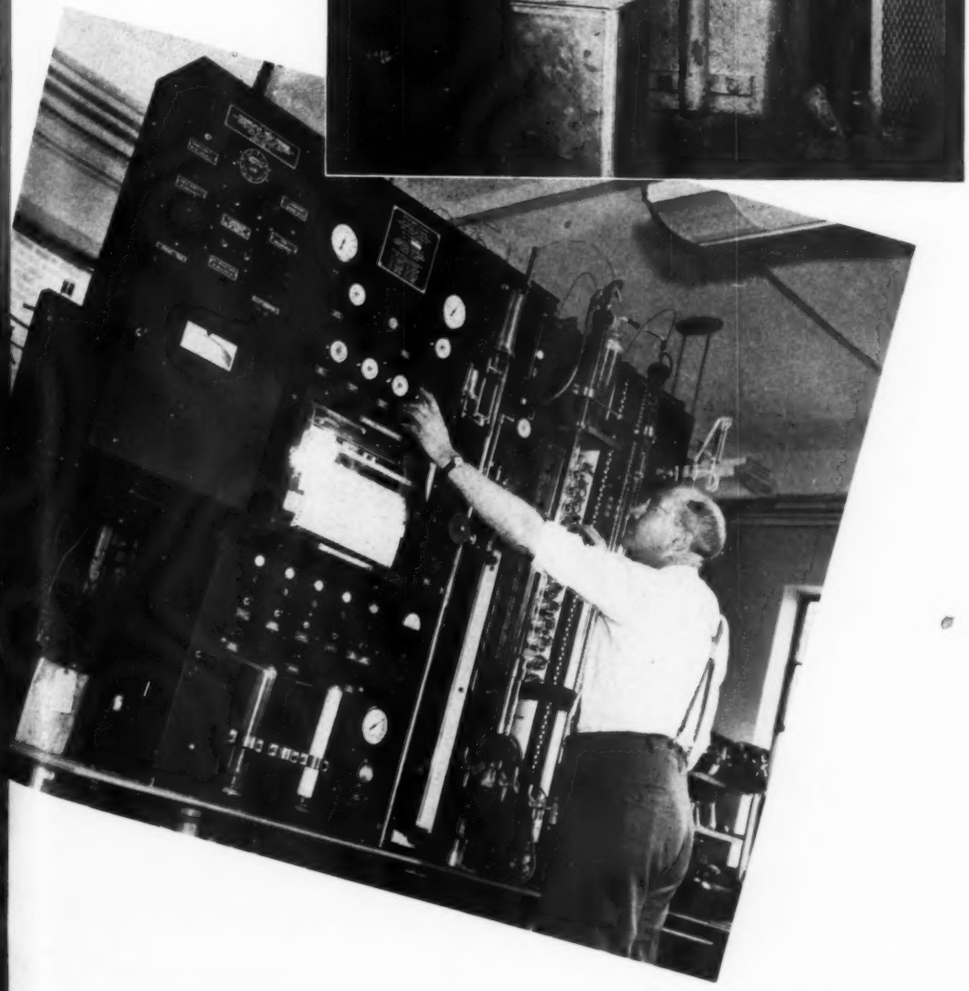


output from all kinds of machines with no sacrifice of precision. This war-born demand for suitable cutting oils rose to new heights with the introduction of new alloys—both ferrous and non-ferrous—together with new methods of machining. The result was new oils for the new metals and the new machines. Here again an "additive" appears in the picture. A new lubricity (oiliness) agent was produced and is increasing output in the machine shop operations, prolonging the life of the tools and improving the finish in many lines. The Socony-Vacuum Laboratories are now starting experiments on oils in the machining of plastics.



Diesel Fuels Tested in a CFR Engine by Raymond T. Moran, Until Recently with the Air Force Overseas.

↓ Laboratory Chemist Charles L. Patterson Operating the Podbielniak.



Another section is equipped with a series of quenching baths where heat-treated or welded metals are tempered or case hardened. For a long time metal workers thought that any oil would be suitable for this purpose, but the Laboratories found that one quencing oil could be better than another; the result is a new line of S/V Quenchoils, and work is already under way to improve them still further.

The war effort imposed many new and unique problems in rust prevention for military equipment. Socony-Vacuum already had a line that would meet ordinary requirements, but a demand was made for products for specific purposes, such as preserving recoil cylinders in heavy artillery and aircraft parts in high altitude flight. The requirements were met, and the experience gained has added improvements to the Savo-Kote and other lines of rust preventers.

Another special section is the Grease Laboratories which occupy several buildings in Brooklyn where are assembled about every known facility for making and testing grease lubricants. Here, through the years have been perfected the Mobilgreases for automotive vehicles, the Gargoyle greases for industry and Aerogreases for aviation. As in other departments, the war imposed demands for new greases to cope with grueling military conditions both on land and on the sea, not to mention special greases for airplane armament. A vast amount of grease research had to be done. One of the accomplishments of the Grease Laboratories was a grease that combines the advantages and avoids the disadvantages of the common lime-base and soda-base grease; the improvement consists in conferring on the grease the ability to perform satisfactorily at high tmperatures and to be resistant to water. Out of this emergency work have come three new Sovarex Greases for peace-time multipurpose use in industrial plants and steel mills.

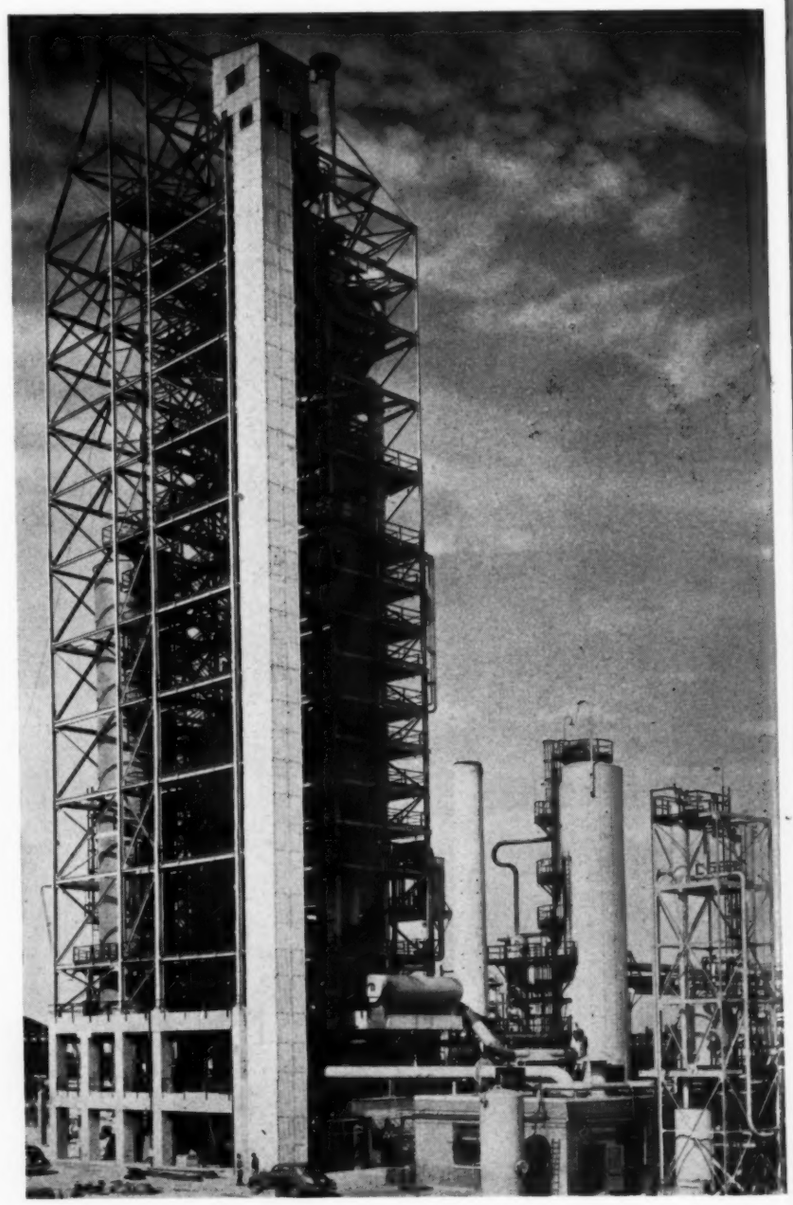
Up to this point the present article has been concerned with the work of Socony Vacuum's General Laboratories on what might be called the normal operations and bulk products of a modern oil refinery. These bulk products—engine fuels, domestic and industrial fuels, lubricating and industrial oils and greases, are accepted as commonplace by the average layman, who has little or no conception of the enormous amount of expense and ingenuity that has been required to endow these products with qualities that will result in a maximum of consumer satisfaction. But beyond the range of these common petroleum products lies a vast and still expanding field of petroleum "process products". To the petroleum refinery technologist a process product is some sort of oil which is needed in a compound destined for some household, industrial, agricultural or other specific purpose, or has to be employed in one or more operational steps in the treatment of raw materials, while these are being converted into finished goods. It is these process products that touch the daily life of everyone. Their uses

are already nearly infinite; as we said before, more than 30 basic industries use petroleum, in a form other than as fuel or lubricant, as an aid in the production of the most different kinds of wares. Requests for such aids in the processing of materials are continually pouring into Socony-Vacuum's Laboratories (and into the research laboratories of other oil companies, although spokesmen for Socony-Vacuum are able to say that their Process Products Section is one of the most complete in the country.) Although few of these special oil products bulk large from a tonnage point of view, in the aggregate they do consume a substantial volume of petroleum and afford a margin of profit that warrants the company in giving adequate attention to them. In recent times the staff of the Laboratories assigned to this work has been doubled, and special facilities to determine product characteristics and to duplicate industrial processing operations have been increased on a corresponding scale. In one room in this section may be seen a kneading machine for compounding some kinds of rubber products where a special oil is required; a launderometer for testing detergents and the scourability of oils; a fadeometer for determining the light stability of processing oils, and a fulling and scouring machine for testing the scourability of textile oils. Other sections contain many other special facilities. To deal adequately with all these problems the Laboratory must be collectively, a Jack-of-all-trades and good at them all.

Working with special test tools, Socony-Vacuum's Process Products technicians have developed a long series of industrial processing aids, including an entirely new series of aromatic processing oils. On miniature heat transfer set-ups they have perfected new oils with superior heat-transfer stability. Using refractive index equipment they have developed special oils for testing the quartz crystals that are essential parts of radio and other electronic equipment. They have cooperated in mosquito control by providing new larvacides; in other directions they have provided plasticizers for synthetic rubbers and resins. The General Laboratories have taken a leading part in the development of petroleum waxes and emulsions, and especially the new microcrystalline waxes. The war created an enormous and greatly diversified demand for these products, from the coating of airplane parts to providing a preservative coating for potatoes, from wax emulsions for making paper and textiles water-repellant to a binder and lubricant in the processing of ceramic products. Another promising advance in process products is the development of new methods for preparing special solvents; these have been used successfully in extracting soybean oil, for making paints and varnishes and for purification of vitamins. And so the list of new products runs on and on, piling up evidence of the unlimited possibilities in this rich field of process products.

Alongside this varied field is another that is hardly less varied and rich. Crude petroleum is both the richest and the most abundant source of raw materials of organic chemicals; it is composed of thousands of different combinations of carbon and hydrogen, along with numerous important sulfur-organics. Socony-Vacuum chemists (and, of course, the chemists of other major oil companies) have long recognized the immense latent possibilities of this material and are actively and successfully engaged in research to isolate these chemicals and to find uses for them. New developments are continuously being pushed forward and have proceeded to the point where most of the major oil companies are definitely in the chemical business, just as surely as any chemical concern that converts coal tar into dyes or pharmaceuticals. Socony-Vacuum's chemical researchers have helped to increase the supply of the basic organic chemicals and have made new contributions on their own; they have taken a leading part in devising new processes for obtaining toluene from petroleum distillates; they have made thiophene from petroleum and changed it from a rarity to a commercial product with remarkable properties. Referring again to additives, those remarkable substances which give wider usefulness and higher quality to many staple petroleum products, Socony-Vacuum's chemists have found in the waste acid sludge from certain refining operation a new material that has remarkable wetting properties of value to the textile, mining, paper and other industries.

It may be repeated that what has been said about the accomplishments of Socony-Vacuum's Laboratories may be said, with modifications in setting and details, about the refinery research organizations of other similar companies, who are working hard to make the infinitely varied riches of crude oil available to the public. No one of the specialities herein described is a basis for big business, but collectively they are; they bring in considerable operating revenue, otherwise no refinery would be much interested in them. The margin of profit helps to reduce the proportionate cost of gasoline and lubricants, and gives the oil companies a wider margin for financing improvements in the production of their products.



→ Commercial TCC Unit at Paulsboro Where Socony-Vacuum's General Laboratories are Located.

How U.O.P. Service Protects your Refinery

Developing refining processes, designing refinery equipment, and supervising its construction, are the functions of UOP with which the Petroleum Industry is most familiar . . . a familiarity which has grown through our years of successful service. ● But . . . unless you are a UOP licensee, you may not realize that our interest does not cease when a unit is completed. In fact, that is when one of our most important activities starts to function. ● What we refer to is UOP Service . . . the constant vigilance which we maintain over every UOP unit after it goes on stream and the numerous facilities which we make available to our licensees. ● It is a service to which every refiner is entitled . . . and a service which every UOP licensee gets.

Operator Training: When a new UOP unit is completed and is functioning properly, our operating men institute a comprehensive training program to impart to the licensee's operators a thorough knowledge of the operation of the equipment. This program is not considered completed until the operators are fully qualified to carry on successfully.

Check on Operating Efficiency: We send expert service engineers to each licensee's refinery. They make careful checks on yield . . . determine the degree of operating efficiency and cost . . . and render such advice and counsel as may be necessary.

Periodic Inspection: At the request of each licensee, licensed UOP units are visited by our inspection men. They make physical inspection of the licensed units, testing instruments for accuracy, checking up on corrosion and fire hazards, and recommending such steps as may be found necessary to assure continued high efficiency.

Laboratory Service: We have what we believe to be the finest and most fully equipped oil research and development laboratories in the world, manned by experienced technologists. These facilities are available to all UOP licensees to aid them in solving their many refinery problems.

Engineering Service: The services of our engineers are constantly available to our licensees to study and analyze special problems and recommend steps to be taken for their solution.

This, in brief, is UOP Service . . . the kind of service that demonstrates our lifetime interest in the efficient, economical operation of every UOP unit.

UNIVERSAL OIL PRODUCTS COMPANY

310 S. MICHIGAN AVENUE UOP CHICAGO 4, ILLINOIS, U.S.A.

LABORATORIES: RIVERSIDE, ILLINOIS

UNIVERSAL SERVICE PROTECTS YOUR REFINERY

International News and Notes

Submarine Drilling Off Trinidad

TRINIDAD PETROLEUM DEVELOPMENT CO. LTD. has received a concession to explore the submarine area off the south shore of Trinidad. As soon as the necessary materials, equipment and labor can be assembled exploratory drilling will be started to test the structure of the area. If there seems to be a possibility of developing commercial production a separate company will be organized to carry on further operations.

To Study China's Refining Needs

ONE of the projects of chief interest to the nationalist government of China is the development of the country's oil resources and the establishment of a modern refining industry. As is well known, one small field has been developed in Kansu province on the southern edge of the Gobi desert. It is some 2000 miles from the coast and 450 miles from Lanchow, capital city of the province. The discovery well was drilled in 1939 and at present 25 shallow wells are producing about 4,000 barrels daily. Confidence is expressed that this Yumen field will be capable of substantially increased production with deeper drilling and that other districts have promising potentialities.

The National Resources Commission of China which is in charge of petroleum development has recently made arrangements with Universal Oil Products to send two of its leading engineers, Dr. Gustav Egloff and W. B. Shanley, to China to make a preliminary study and recommend plans for the expansion of the country's refining industry. Their report will cover such subjects as improvement in the operation of existing refineries, repairs and changes needed to restore damaged plants and the coordination and expansion of refining facilities to meet present and future regional and national needs of China.

To Explore Bahamas Area

ACCORDING to a statement of the British Secretary of State for the Colonies, in London, allocations to explore for oil in the Bahamas and adjacent waters have been granted to a number of companies. Permits granted thus far cover an area of nearly 50,000 square miles surrounding the islands and extending westward nearly to the Florida Keys. Among the companies receiving grants are the following in order of the size of their holdings: Anglo-Bahamian Petroleum Co. Ltd., subsidiary of Anglo-Iranian Oil Co. Ltd., 12,925 sq. miles; Bahamas Oil Co. Ltd. (Superior Oil Co. of California) 8,996; Standard Oil (Bahamas) Ltd., (Standard Oil Co. N. J.) 8,474; British Bahamian Oil Development Co. Ltd. (Central Mining and Investment Corp.) 6,434; Shell Overseas Exploration Co. Ltd. (Shell Group) 5,392; Bahamas Oil Exploration Co. Ltd. (Gulf Corporation) 3,676; Nassau Oil Mining Co., 1,502.

President Rios Inspects Sample of Oil from Spring Hill No. 1

Iran's Wartime Output

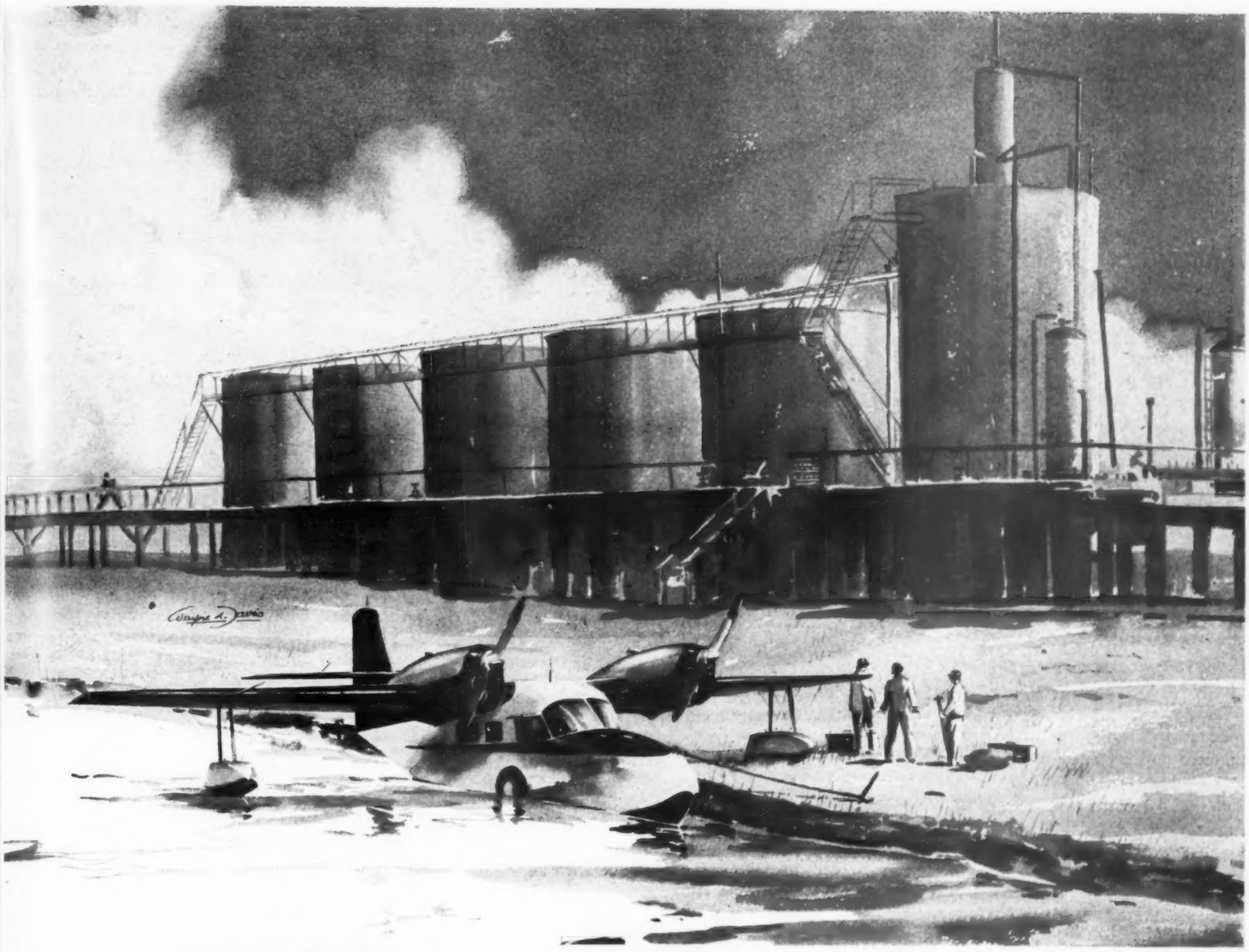
STATISTICS of production of crude petroleum and products during the period of the war, when figures of current operations were restricted, have been released by Anglo-Iranian Oil Company Ltd.

Year	*Tons*
1939	9,583,285
1940	8,626,639
1941	6,605,320
1942	9,399,231
1943	9,705,769
1944	13,274,243
1945 (to Oct. 31)	13,621,576

Oil In Tierra Del Fuego

FIRST tangible result from the scientifically directed search for petroleum which has been carried on in Chile for the past four years under the direction of the Chilean government was reported at the end of December. A drill stem test made from ten feet of oil sand at 7428 feet produced encouraging showings of high quality oil. The well is located in the northeastern part of the island of Tierra Del Fuego just south of the Straits of Magellan in an area geologically designated as the Santa Cruz basin.

Some five years ago the government controlled corporation, Compania de Fomento Produccion, entered into a contract with the United Geophysical Company for seismic surveys and a geological study under the direction of Glen M. Ruby. The fact that oil has been found in the first location drilled is an indication of the soundess of the geological work and gives reason to believe that a good-sized field may be developed within the area selected for exploratory drilling. The wildcat from which the showings reported last month were obtained is designated as Spring Hill 1. Drilling is being continued to determine the thickness of the oil sand and the underlying formation. Following the completion of this well other locations which already have been selected will be tested. The drilling is being done by the J. K. Livermore Corporation of Lubbock, Texas, under contract with Compania de Formento.



The Widgeon at Work

The field superintendent in the oil industry who formerly needed 4½ hours to complete one operation can do the same job with a *Grumman Widgeon Amphibian* in 45 minutes.

The combined land and water operation of the amphibian plane was of great importance during war and is proving of equal utility to industry in peace.

Now the new 1946 *Grumman Widgeon* with improved water performance is available for thirty day delivery.

For further information write Sales Department.

Grumman

AIRCRAFT ENGINEERING CORPORATION

Bethpage, Long Island, N. Y.

Oil Company Staff Changes

J. L. Latimer

Frederic R. Pratt

J. L. LATIMER has been elected president of Magnolia Petroleum Company and Magnolia Pipe Line Company to succeed D. A. Little who has retired because of ill health. Mr. Latimer has been a Magnolia employee for 30 years, rising from tank car loading rack helper to his present position as head of the two companies.

In 1937 he was promoted from general superintendent to assistant general manager of the pipe line company. A year later he was elected vice president and director of both companies.

Mr. Little was president of the two companies for 13 years before his retirement. He entered the company as a bookkeeper and later became assistant treasurer, vice president and in 1933 was made president.

FREDERIC R. PRATT has been appointed general manager of the marine transportation Department of Socony-Vacuum Oil Company, Inc. to succeed Charles H. Kunze who has retired. Mr. Pratt recently returned to Socony-Vacuum after four years in the Coast Guard. He enlisted as a chief boatswain mate and held the rank of Lieutenant Commander when he received his honorable discharge. He entered the marine transportation department of Socony-Vacuum in 1931. In 1940 he was transferred to the distribution department.

Mr. Kunze joined the company in 1904 as an office boy, in what was then known as the Foreign Shipping department. He was appointed general manager of the Marine Transportation department on December 1, 1941. He is executive vice president and a member of the board of directors of War Emergency Tankers Inc., a member of the board of managers of the American Bureau of Shipping, Lloyd's Register of Shipping (American Committee), New York Produce Exchange, board of trustees of the United Seamen's Service, Inc. and the Maritime Association of the Port of New York.

RESIGNATION of Ralph W. Gallagher as chairman of the board of directors and chairman of the executive committee of Standard Oil Company (New Jersey), effective December 31st, was announced "with deepest regret" by the board. Mr. Gallagher, who became a director of the company in 1933, is retiring after spending his entire 49-year business career with Jersey Standard and its affiliates.

The board at the same time announced the election of Frank W. Abrams, a vice president and director of the company, as chairman to succeed Mr. Gallagher. Eugene Holman, president, continues as chief executive officer of the company and succeeds Mr. Gallagher as chairman of the executive committee. J. R. Suman, a vice president and director, becomes a member of the executive committee.

Ralph W. Gallagher

The board also announced the election of R. T. Haslam, a director since 1942, as vice president, and S. P. Coleman, head of the economics and coordination department, as a director.

Mr. Gallagher headed Standard Oil Company (New Jersey) during World War II, when the industrial capacity of the company and its affiliates became a major factor in supplying petroleum to the United States and her allies.

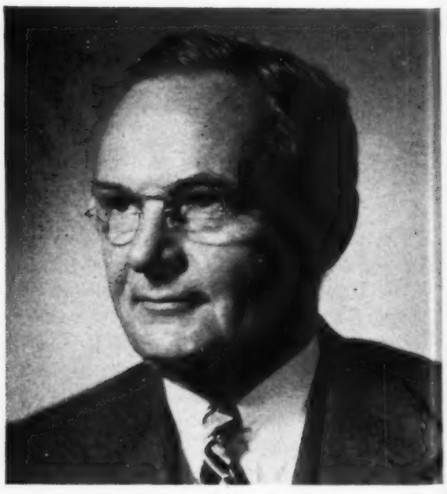
Going to work at 16 as an oiler in a pumping station, Mr. Gallagher rose through the gas and petroleum industry to one of the world's most responsible industrial positions. Elected a director in 1933, he became vice president in 1937 and chairman of the board in 1942.

Mr. Gallagher was born in Salamanca, N. Y. in 1881. He left high school because of the illness of his father, a hardware merchant, to take his first job with the New York Transit Company at Olean, N. Y. His duties as an oiler included sweeping out the pumping station every day. At night he studied engineering.

In 1900 at the age of 19 he went with the East Ohio Gas Company, a Jersey Standard subsidiary, in Akron. Two years later he was made assistant superintendent, one of the youngest men ever to be in charge of pipeline construction. In 1906 he took over direction of all pipeline work and became superintendent of all distributing plants outside of Cleveland. In 1926 he was elected president of East Ohio.

Mr. Abrams, the new board chairman, was born in Rockville Center, Long Island, in 1889 and has been a leading figure in the development of oil refining for 53 years. His first job was as

Frank W. Abrams



One Jointing for all purposes

Let "Klingerit," the Universal Jointing, replace the several different kinds usually stocked on your shelves for various purposes, and thus simplify ordering and stock control and reduce the risk of an unsuitable material being used by mistake.

"Klingerit" Compressed Asbestos Jointing can be supplied in all thicknesses ranging from ·008" to $\frac{1}{4}$" and can be used for saturated and superheated steam at high pressures and temperatures, hydraulic pressures, compressed air and gases, oils, petrol, solvents, refrigerants, alkalis, and most acids.

RICHARD KLINGER LTD.

KLINGERIT WORKS • SIDCUP • KENT • ENGLAND • TEL: FOOTS CRAY 3022

AGENT FOR U. S. A. *Klingerit Inc., 16-22 Hudson Street, New York 13, N. Y*

AGENT FOR CANADA: *The Canadian Asbestos Company, 316-322 Youville Square, Montreal.*

a draftsman with the Eagle Works of the company at Jersey City in 1912 after graduating from Syracuse University. In 1914 he was named assistant superintendent of the Eagle Works and three years later was appointed superintendent. He was subsequently made manager of the Eagle Works and of the company's Parkersburg, West Virginia, refinery.

Mr. Abrams was named head of all refining operations of the company in the New Jersey area in 1926, and was elected president of the principal domestic refining and marketing affiliate of Jersey Standard in 1933. He was elected to Jersey Standard's board in 1940 and was made a vice president in 1944.

Mr. Haslam, who becomes a vice president, has been with the company since 1927, and has served as director of research and later as general sales manager prior to being named a director in 1942. Mr. Coleman has been associated with the company in research, refining and economics for more than 25 years.

HAROLD O. SMEDLEY, Skelly Oil Company district geologist at Wichita, is the newly elected president of the Kansas Geological Society He succeeds Virgil B. Cole of Gulf Oil Company.

M. L. (VERNE) MAYFIELD, petroleum engineer of Houston, Texas, recently technical advisor-engineer for the Natural Gas and Natural Gasoline Industry Committee, and formerly assistant district director of Natural Gas and Natural Gasoline Division, Petroleum Administration for War, District 3, has opened offices in the Mellie Esperson Building as consultant on petroleum production, natural gas and gasoline problems.

He has recently assisted the Gas Conservation Engineering committee appointed by the Railroad Commission of Texas (Murray Committee) in their study of production, disposition and conservation of oil-well gas in Texas.

GORDON T. GRANGER, until recently Houston district refining director for PAW, has been made manager of the newly organized petroleum and chemical division of the J. A. Jones Construction Company, Inc., Charlotte, N. C. He will be associated in the new division with J. J. Allinson who has been elected vice president.

Both Mr. Granger and Mr. Allinson have been associated with the oil refining industry in the southwest for many years. Mr. Granger was a plant manager for Barnsdall Oil Company and its successor Bareco, before joining the PAW and Mr. Allinson was vice president in charge of refining for Lion Oil Refining Company.

During the war Mr. Allison was chief resident engineer of the atomic bomb project at Oak Ridge, Tenn. The petroleum and chemical division of the Jones Company expects to apply some of the atomic plant techniques to oil refining, cycling and natural gasoline operations. Offices of the new construction organization will be in the Scanlon Building in Houston.

DR. L. W. PARSONS has been appointed manager of export sales for the eastern division of Tide Water Associated Oil Company. During the war Dr. Parsons was manager of the company's Washington office. Prior to that he was chief technologist in charge of research and development of the company's eastern division, and later head of sales engineering for the wholesale, export and industrial products department, eastern division.

LOUIS D. MANN has been appointed vice-president and general manager of Cities Service Refining Corporation at Lake Charles, La.

William W. Lowe, former general manager of the vast, war-born Lake Charles refinery, will return to New York where he will join the staff of Petroleum Advisers, Inc. G. L. Mateer, former general superintendent at Lake Charles, will also move to New York as technical director of manufacturing operations in the Petroleum Advisers group, under A. P. Frame.

Louis Mann has been 28 years with Cities Service, having started as a chemist in 1917. Before the war he was assistant general superintendent of all refineries operated by Cities Service Oil Company (Del.).

When Cities Service undertook the construction and operation of the Maumelle Ordnance Works at Little Rock, Ark., Mr. Mann was picked to run it. Manufacturing a critical high explosive, the vast, sprawling plant was one of the most secret operations of the war.

RALPH B. LLOYD, president of Lloyd Corporation, Ltd., was reelected president of the Western Oil and Gas Association for his fifth consecutive term at the recent annual meeting of the Association. Also elected as vice-presidents were William Reinhardt, vice-president, Union Pacific Railroad Company, and H. D. Collier, chairman of the board, Standard Oil Company of California. John B. Sutherland, division manager, Ohio Oil Company was named treasurer. Other officers of the Association reelected are Don E. Gilman, executive vice-president, David S. Kilgour, secretary, George F. Prussing, technical secretary, and John M. Peirce, economist.

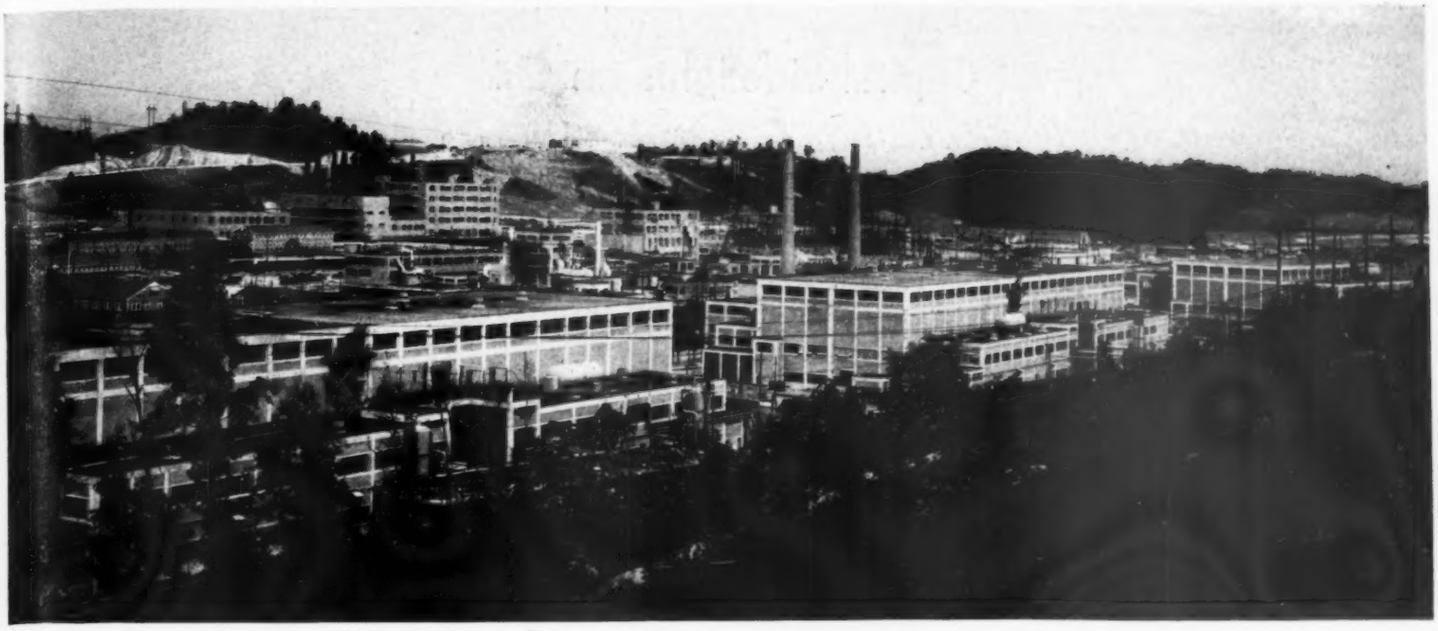
HOWARD G. VESPER has been elected president of California Research Corporation, Standard of California's research subsidiary. He succeeds Ralph A. Halloran who is retiring as head of Standard's research activities.

Three other California Research management shifts also were announced. Alois Kremser leaves as vice-president to become personal adviser on research matters to R. G. Follis, president, and two men move into vice-presidencies. L. P. Elliott, formerly assistant director of the Richmond laboratories, takes over Kremser's duties, while A. L. Lyman, who was in charge at Richmond, becomes director of all laboratories.

M. L. Mayfield

Louis D. Mann

Howard D. Vesper



ELECTROMAGNETIC

Stone & Webster Engineering Corporation recommended the electromagnetic process among several possibilities as the quickest way to mass produce U-235—the essential element in the Atomic Bomb.

How successful this process was is indicated in the Smyth Report.

We quote:

"Construction of the first series of electromagnetic units at Clinton began in March of 1943 and this part of the plant was ready for operation in November 1943."

8 MONTHS TO FIRST OPERATION

"For nearly a year the electromagnetic plant was the only one in operation."

A YEAR AHEAD IN PRODUCTION

"The electromagnetic separation plant was in large-scale operation during the winter of 1944-1945 and produced U-235 of sufficient purity for use in atomic bombs."

QUALITY AND QUANTITY PROVED.

ENGINEERS & CONSTRUCTORS
of one of the
MAJOR ATOMIC BOMB PLANTS
AND THE CITY OF
OAK RIDGE, TENNESSEE

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Capital Sidelights on Oil

By W. J. Maddox, Chief of World Petroleum Washington Bureau

Holds Gas Last Resort for "Inches"

W. Stuart Symington

IN his report to Congress on the disposal of government-owned pipe lines, W. Stuart Symington, Surplus Property Administrator, says that first preference will be given to continuing the Big and Little Big Inch in petroleum service. Here are the highlights of his disposal plan:

(1) If the Big Inch and Little Big Inch cannot be disposed of for the movement of crude oil and petroleum products from the southwest to the eastern seaboard they should be disposed of for services to interior points.

(2) Disposal to private interests will be given preference.

(3) All segments of the petroleum industry, particularly small independent operators, will be given the opportunity of acquiring the lines.

(4) Should it prove impossible to sell the lines to the petroleum industry, consideration will be given to the possibility of lease.

(5) Public operation on a full cost basis may have to be considered if all efforts to dispose of the lines to private industry should fail.

(6) Disposal for convention to natural gas will be favored only if it proves impossible to keep the lines in petroleum service and the national security is otherwise adequately protected.

Ickes Resignation Rumors

IT looks as though the latest outcropping of the oft-revived Ickes' resignation rumor has some real substance and that a new Secretary of Interior may be named before 1946 is far along. Some forecasters point to the recent resignation of Abe Fortas, Ickes protege, from his post as assistant secretary, as a harbinger that the end is near, although the "Curmudgeon" himself still answers in riddles all questions concerning his course of action.

General belief is that Ickes has not been happy in his job for some time, despite the fact that back in August, when he turned in his written resignation to the White House, Truman told him he could stay as long as he wanted and on his own terms. Ickes is thought to have taken this literally and stayed on with one of his own "terms" being the approval of the man selected to succeed him as Secretary of Interior.

Nomination of Ed Pauley, California oil man, as Under Secretary of Navy with the prospect that he will be stepped up to head the department when Secretary Forrestal retires has put an end to talk of his selection for the Interior post and clears the way to Icke's retirement whenever he is satisfied that the time is opportune to end his record long service.

Praises Oil Labor Panel

Frank P. Graham

THE Oil Wage Panel, which wound up its task January 12 with a recommendation for an 18 percent increase to workers in the industry, was the first body appointed in the spirit of President Truman's address of December 8 and thus, in a way, had the job of blazing a trail in fact-finding procedure that may furnish a model for other such boards. The three-man panel, composed of Frank P. Graham, chairman, Paul Eliel and Otto S. Beyer, worked out their pattern of procedure as they went along. As a tribute to the panel's work, Secretary of Labor Schwellenbach said: "Representatives of both sides have expressed appreciation of the care, patience and fairness with which the procedures have been developed and the hearings conducted."

The oil fact-finders adhered to one principle that may be useful in future wage adjudications, namely that such issues can best be settled between employers and employes. During the proceedings they repeatedly urged the resumption of direct negotiations and at the request of the parties a recess from December 21 to January 7 was taken to permit them to continue the discussions among themselves. As a result, several companies arrived at a settlement on the basis that the panel later recommended.

To Use German Equipment

TRANSFER to this country of several thousand tons of equipment and supplies from captured German and Japanese synthetic fuel plants and laboratories is expected to speed up the Bureau of Mines' oil-from-coal program, saving much time and money, according to Dr. R. R. Sayers, director. Bureau engineers have combed remains of the German plants and have compiled a list of the equipment desired, dimensions and weights, and where each item is likely to be found. The list of hydrogenation, gas synthesis and coal treating equipment has been submitted to the commanding general of the United States forces in Germany.

According to reports coming to this country, Russia also is on its toes in the synthetic fuels field, despite the fact that its natural petroleum reserves came through the war virtually untouched compared with the intensively developed oil fields of the United States, which yielded 8,866,000,000 barrels during the war. Most of Germany's synthetic fuels plants are in the British and Russian zones, but the equipment desired by the Bureau of Mines is also available in the areas occupied by American forces.

Tass, official news agency of the U.S.S.R., recently announced the start of construction on two synthetic fuel plants, one of which is designed to yield 500,000 metric tons of liquid fuels annually. It is stated that this plant will occupy 750 acres and consist of some 900 buildings, a development which alone dwarfs the five-year program of research and development authorized by Congress for the Bureau of Mines. At the same time new Soviet drilling is reported to have reached an unparalleled peak.

Navy has volunteered to aid the bureau in obtaining hydrogenation and oil-refining pilot plant units which were found intact at a Japanese naval installation. In return, the bureau has agreed to cooperate with the Navy in a mission to investigate Jap developments in synthetic fuels, petroleum and lubricants. Information obtained is expected to aid both Navy and Interior.

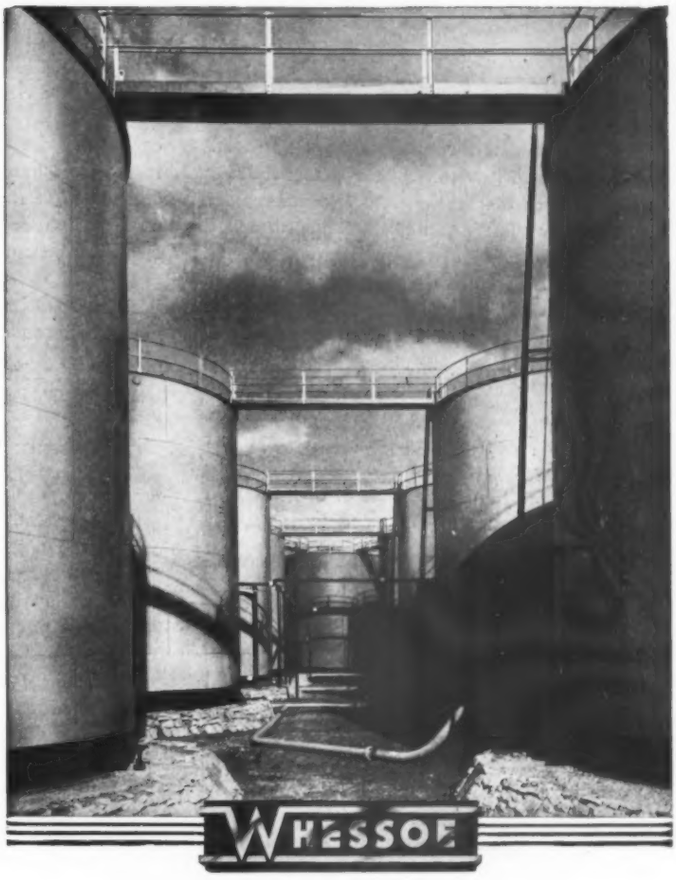
Heads Synthetic Research

Dr. Lester L. Hirst

DR. LESTER L. HIRST of Pittsburgh, Pa., who has been named acting chief of the government's new hydrogenation demonstration plant to be established at the Missouri Ordnance Works near Louisiana, Mo., is a pioneer in American research on synthetic liquid fuels. Dr. Hirst has accepted custody of the $17,500,000 plant, a wartime producer of synthetic ammonia, from the Army Quartermaster Corps on behalf of the Bureau of Mines. It is planned, following a period of conversion, to begin producing gasoline and oil on a demonstration basis from coal and lignite in about a year.

Whessoe

Service to the Petroleum Industry



Tanks and pressure vessels are designed, fabricated and quickly erected by the Whessoe Company's organisation which has been built up to meet the needs of the Petroleum Industry.

Head Office: DARLINGTON ENGLAND
London Office: 25 VICTORIA STREET, WESTMINSTER S.W.1

WHESSOE, LIMITED
Formerly THE WHESSOE FOUNDRY & ENGINEERING CO. LTD.

HOLMES-CONNERSVILLE AIR BLOWERS

FOUNDED 1850
HOLMES
HUDDERSFIELD

These machines deliver a positive, reliable and oil-free supply of air, economically and efficiently. Absence of internal contact ensures long life, low maintenance costs and continuous operation over long periods.

It is also extensively used for Gas Exhausting or Boosting and over 1,400 machines have been supplied for these purposes.

Manufactured under Licence from Roots-Connersville Blower Corporation of America, for Great Britain, the Dominions and Colonies

W. C. HOLMES & CO. LTD., HUDDERSFIELD, ENGLAND
LONDON OFFICE. 119 VICTORIA STREET, LONDON, S.W.1
MIDLANDS OFFICE. 21 BENNETT'S HILL, BIRMINGHAM, 2

Elimination of Germany's Synthetic Industry

(*Continued from page 27*)

million dollars. Although no figures are available for British investments, the committee said, it is probable that their share amounted to an even greater sum. The bulk of Allied capital is in activities connected with production, refining, and distribution of natural oil. Allied shares in the synthetic oil industry could not be estimated because of lack of information, but the committee thought the amount was unimportant.

As to the present capacity of German refineries and synthetic oil plants, the committee says that without new construction production could be restored to the January 1945 level of 20 percent of pre-raid capacity in synthetic plants and 35 percent of pre-raid capacity in refineries. Just prior to the capture by Allied forces, all of the synthetic oil plants west of the Rhine and in the greater Ruhr valley were classified as having production suspended indefinitely because of damage to vital installations. Of the plants in central Germany four had suffered damage to vital installations, and one was inpartial production. Of the three plants east of the Oder-Neisse, two had incurred damages to vital installations and one to non-vital installations. Facilities in central Germany apparently were less severely damaged than those in eastern and western Germany. The committee's estimate of possible restoration of production is based on the assumption that damaged plants be cannibalized into operation.

The pre-raid capacity of German crude oil refineries, the committee points out, has been estimated at about 1.8 million tons. If the activity of these refineries is restricted to the processing of domestic crude alone, production of which is estimated at 750,000 tons a year, there will be available a million tons of excess refinery capacity. Full utilization of facilities to process imported crude oil would thus yield an additonal 950,000 tons of refined products for German consumption, raising the total available supplies to 3,750,000 tons per year.

Restoration and full utilization of existing Bergius and Fischer-Tropsch plants would raise German domestic supplies to eight million tons a year if no crude is imported and to almost nine million if foreign crude is refined in Germany.

FEA's disarmament program provided also for disposition of Germany's synthetic rubber facilities and for controls. The findings on which these recommendations were based were assembled by a separate rubber group. This committee recommended elimination of all plants, parts of plants and equipment capable of manufacturing any form of synthetic rubber. The recommendation covers the polymerization plants and also plants manufacturing the necessary monomers. A large part of the equipment for making synthetic rubber is similar to that used in the manufacture of various chemicals and plastics, and for this reason the committee advised that the removal or destruction of synthetic rubber plants and equipment should be entrusted only to expert field operatives who are familiar with the processes.

Time for the removal or destruction of the plants and equipment is not fixed. The occupying forces, the group said, may have need of synthetic rubber in the early post-surrender period or for use of such forces or for the relief of liberated areas.

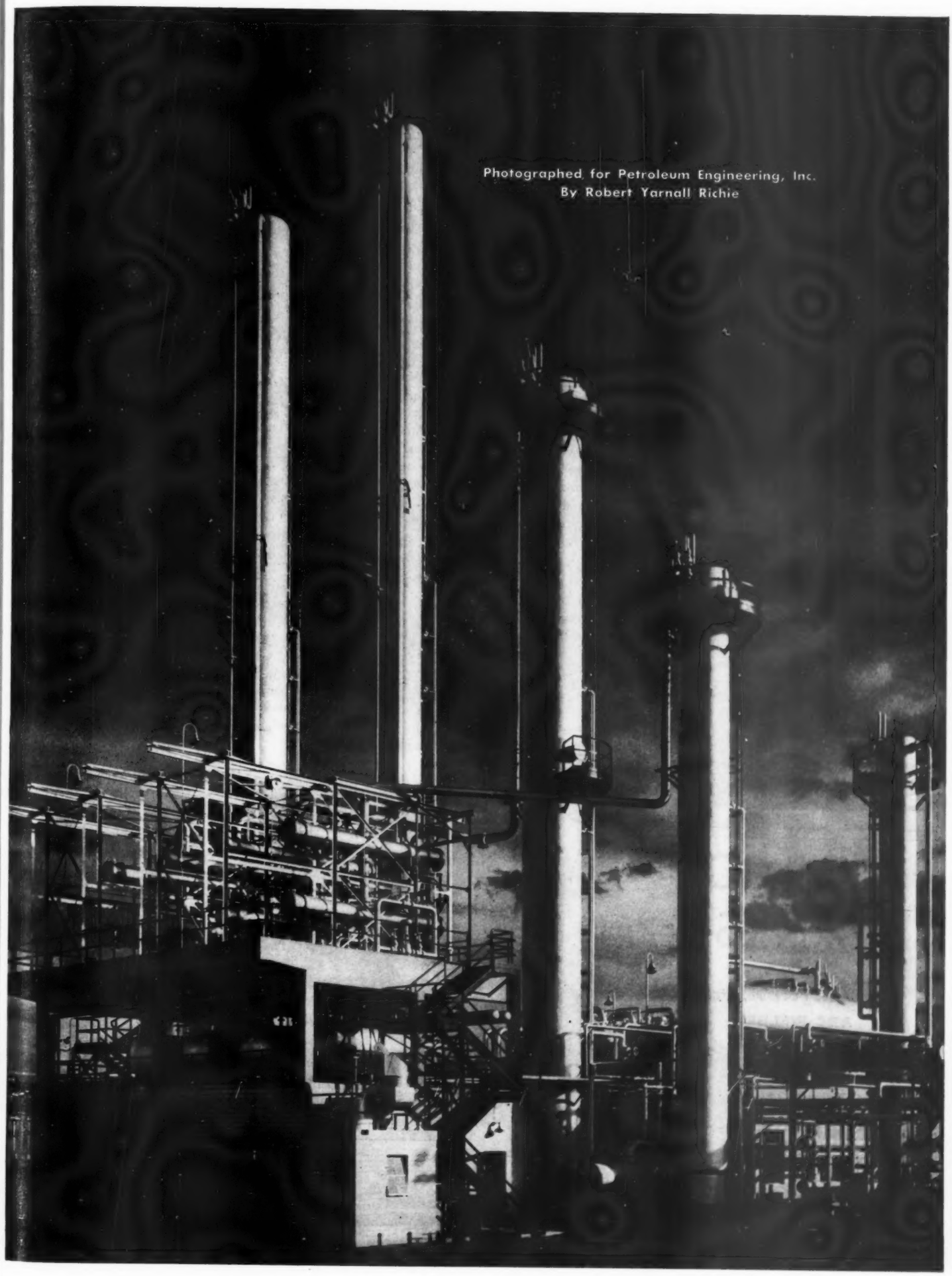
As for the rubber manufacturing industry, the committee recommended that war products, such as the following, be prohibited: All rubber parts for aircraft and airplane tires and tubes; all bullet sealing rubber products, such as cells and hose; airship envelopes and barrage balloons; combat tires, such as "run-flat" tires; tank tread blocks, and bogie wheels; submarine jars and parts; munitions handling equipment; and high altitude oxygen masks. In the field of civilian products, that the German rubber products industry be eliminated in part, as a safeguard against the redevelopment of Germany's war potential in rubber. The amount of production permitted will allow Germany to maintain at least a "minimum subsistence level". The methods suggested to maintain that level are:

(1) Limitation on permissible imports of natural, synthetic reclaimed, and scrap rubber. The maximum to be permitted is one pound of crude rubber, or equivalent, per year. At the estimated population of 65,000,000, this is equivalent to 29,000 long ton per annum - approximately the domestic absorption in the pre-Hitler era (2) Destruction or removal of all manufacturing capacity in excess of that required for processing the permissible imports into permitted goods for civilian use.

The committee was divided on the matter of controlling the reclaiming industry. The majority decided to treat reclaim on the same basis as synthetic - to prohibit its manufacture and limit the imports. The minority felt that evasion would be difficult and that some manufacturing should be permitted.

For controlling the remaining portion of the German industry, certain "administrative devices" were recommended, which the committee said "are no more stringent than the system of controls which has been in effect in Germany of several years." The controls should be clamped on at the "earliest possible time", the committee recommended, and said "the only permissible delays in their activation would be in the case of specific plants whose output is needed by the occupying forces or competent authorities for the liberated areas."

View of the Shell Oil Company cycling plant at Sheridan, Texas . . . one of the numerous gas processing plants designed and constructed by Petroleum Engineering, Inc. during its 16 years service to the industry. PETROLEUM ENGINEERING, INC. Offices: Houston and Tulsa.



Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

When You Rent The E-C Inclinometer

Our rental customers receive the E-C Inclinometer in this compact carrying case. They are assured of the security and accessibility of the contents.

The E-C Inclinometer is made of K-Monel Metal, which is the highest possible grade material and lends itself to great accuracy in fabrication. The carrying case also is of K-Monel Metal sheets and N. P. brass.

SPERRY-SUN WELL SURVEYING CO.
1608 WALNUT ST., PHILA. 3, PA.

STORAGE TANKS

any capacity

for OIL, PETROL, etc.

ARC WELDED

We are experts in the designing, manufacture and erection of Welded Tanks.

COMPLETE INSTALLATIONS

SEND US YOUR INQUIRIES

Oxley Engineering Co., Ltd.

HUNSLET LEEDS, 10 ENGLAND

Telephone: LEEDS 27468/9 Telegrams: OXBROS LEEDS
LONDON OFFICE: Winchester House, Old Broad Street, E. C. 2
Telephone: LONDON WALL 3731

Four New Items Announced

PATTERSON - BALLAGH CORPORATION has announced four newly designed special items for oil field service which incorporate synthetic rubber. The synthetic rubber parts are highly resistant to abrasion and to swelling and softness due to contact with oil. In all cases the rubber parts are quickly and easily replacable.

The newly-designed sucker rod wipers are made in both a universal and a special paraffine-remover style. Each type is available with either plain or safety cap head. The wiping is done by self-aligning, reinforced discs of PBX synthetic rubber in suitable sizes. The paraffine remover head has two side outlets for discharge of excess paraffine.

Another new specialty is a shock absorbing bumper for installation on top of the traveling block. This is especially important in the portable type rig where the driller cannot see the crown block from this station. Rubbers are of large diameter covering the entire face of the block and are securely attached to prevent falling despite a violent blow. Bumpers are made for most styles of Regan, Oil Well, Emsco, Baash-Ross, Nasco, Ideal, Ideco and others.

As a companion to the wire line guide the company has developed a new dead-line stabilizer which does not bend the line and prevents—destructive whip. Line failure at the finger board is prevented. Only wearing part is the oil-proof synthetic rubber lining.

A new Patterson-Ballagh mud mixer is improved by the addition of a second mixing chamber. It is so designed that it may be adjusted from a horizontal to a 90-degree flow. The new mixer is a heavy-duty unit specialty designed for breaking up mud weight and mud conditioning materials such as aquagel.

Nomads Elect Officers

AT the annual meeting of the New York chapter of Nomads the following officers were elected to serve during the coming year: John H. Baird, president; R. M. Dinges, vice president; J. W. Reed, secretary; K. J. Langley, assistant secretary; D. J. Muldoon, treasurer; E. F. Gahan, assistant treasurer; B. A. Hilliard, sergeant-at-arms; G. W. Knight, assistant sergeant-at-arms; W. J. Campbell and V. R. Wittich, regents.

Reopens Detroit Office

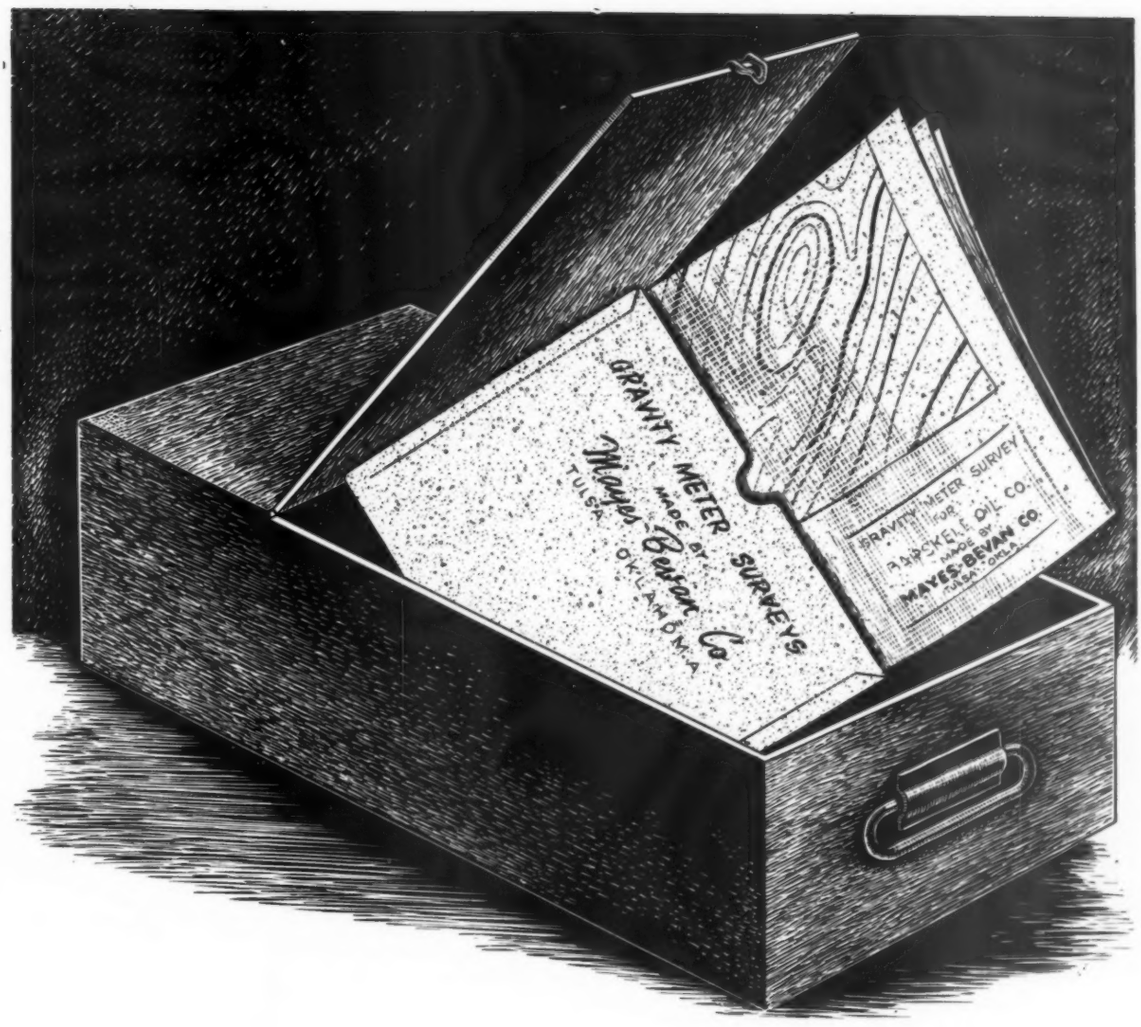
THE Chicago Bridge & Iron Company reopened Detroit sales office on January 1st in the Lafayette Building. Edward D. Barrett, formerly of the Chicago Office, is in charge.

Three Axelson Generations Active in Co.

THREE generations are active in the Axelson Manufacturing Company of Los Angeles and another young Axelson, although only 18 months old, already is a familiar figure about the plant. Recently the acompanying photograph of all four generations was snapped in the company offices. In the picture Jack Axelson is on the left. Jack's son, Stephen Charles, is on the lap of his grandfather, Delbert Axelson, and at Delbert's right is his father, Charles F. Axelson, who is still active in the business at 81.

The California firm was founded 54 years ago by Charles F. Axelson and his brother, Gustavus, who also is still active in the business as chairman. Missing from the picture is J. C. Axelson, company president and brother of Delbert Axelson, company vice president.

During the war Axelson Manufacturing Company won four stars on its "E" flag awarded early in the war.



An INVESTMENT In The FUTURE

A Mayes-Bevan Survey is indispensable in the exploration of new oil provinces and its value will increase many fold with the development. The quantity of gravity meter work being done in the proven oil provinces of the United States is a demonstration of its continued value.

Mayes-Bevan Company M/B *Gravity Meter Surveys*

KENNEDY BLDG. • TULSA, OKLA.

AIRETOOL'S NEW FORM CUTTERS

PREVENTS TUBE CLEANER TRACKING

STOPS TUBE DAMAGE

The operator of Airetool Tube Cleaners need have no fear of cleaner damaging tubes. That is because the *new form cutters*, used in Airetool Tube Cleaners, eliminate the tendency of the cutter to track. The periphery of the cutter is milled to divide sections of the circumference in teeth of various pitch, which prevents the cutters finding same spot in a tube wall during each revolution — an exclusive Airetool development.

Other Airetool Tube Cleaner features are: A 28% more powerful motor made possible by the Airetool Balanced Rotor and Power Seal, precision construction of finest alloy steels, ease of operation. Made for tubes ½" to 24" I.D.; straight or curved.

AIRETOOL TUBE EXPANDERS

Airetool Tube Expanders are precision tools, made to efficiently and thoroughly perform any tube rolling operation. They are precision built of heat treated alloy steel, with a maximum amount of tortional strength provided in the mandrel to resist the extreme twisting action and another special alloy steel in the roll to resist compression during the rolling operation. Made for tubes ½" to 12" I.D.; straight or curved.

Airetool offers a complete line of equipment for tube maintenance including tube jigs, gauges and calipers.

Helpful Bulletins FREE Write for your copy

Dept. WP

Airetool & Yost-Superior Factory Bldgs.

Springfield, Ohio

AIRETOOL MANUFACTURING COMPANY

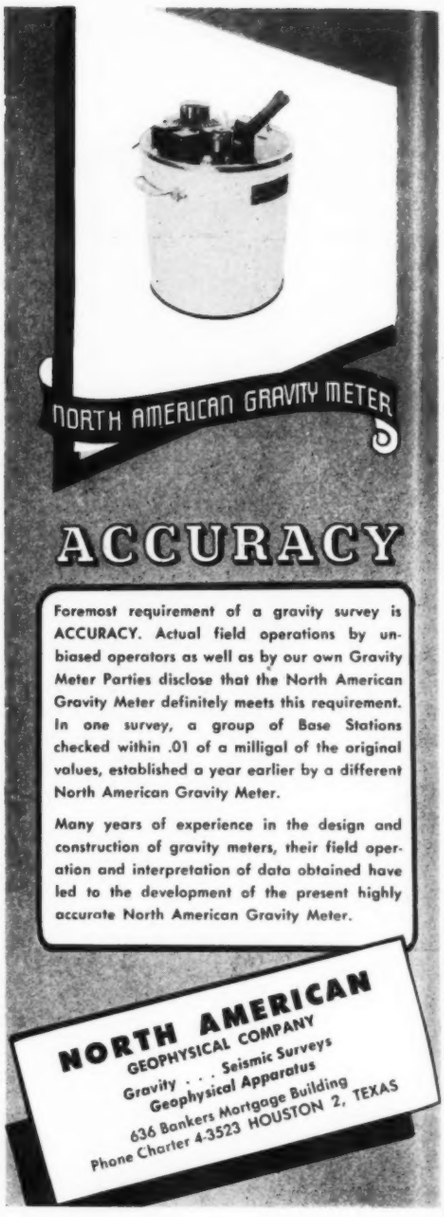
Refinery Construction

(*Continued on page 32*)

war only a slight beginning has been made. Unsettled conditions and difficulty in obtaining and transporting materials have combined to delay action in this direction. Borneo was the first Pacific oil producing territory to be wrested from Japanese control and refineries there have been put back into operation at part capacity. In Java and Sumatra, however, local disturbances have prevented the execution of plans prepared by the oil companies for re-establishment of the large plants located there. Burma's refineries were very effectively destroyed in face of the Japanese invasion and plans for their replacement are dependent as to certain points on decisions of the British government.

Political complications play an important part in refinery restoration on the European Continent. In France and Italy repairs to plants not too seriously damaged have enabled these to resume operations on a reduced scale but in the case of refineries that require virtually complete rebuilding the owners are inclined to wait until government policy toward the industry is more clearly defined. The fate of Germany's oil industry is still undefined. Recommendations of a special technical committee for complete elimination of synthetic plants and limitation of processing facilities for natural petroleum to the country's limited production are the subject of an article on other pages of this issue.

In eastern Europe where Russian influence prevails, considerable progress has been made toward the restoration of damaged plants and a number of them are in operation but no details have been made public. Within the Soviet Unions own boarders now refining facilities have been established to take care of increased production and a number of additional plants are projected. A substantial part of the loan that Russian has been negotiating in the United States is to be applied to the purchase of oil industry equipment.


NORTH AMERICAN GRAVITY METER
ACCURACY
Foremost requirement of a gravity survey is ACCURACY. Actual field operations by unbiased operators as well as by our own Gravity Meter Parties disclose that the North American Gravity Meter definitely meets this requirement. In one survey, a group of Base Stations checked within .01 of a milligal of the original values, established a year earlier by a different North American Gravity Meter.
Many years of experience in the design and construction of gravity meters, their field operation and interpretation of data obtained have led to the development of the present highly accurate North American Gravity Meter.
NORTH AMERICAN
GEOPHYSICAL COMPANY
Gravity . . . Seismic Surveys
Geophysical Apparatus
636 Bankers Mortgage Building
Phone Charter 4-3523 HOUSTON 2, TEXAS

Enlarges Activities

THE Maloney-Crawford Tank and Manufacturing Company of Tulsa, until recently known as the Maloney Tank and Manufacturing Company, is enlarging its sales and service activities. Harold D. Crawford, who purchased an interest in the company, is now secretary-treasurer; S. P. Wallace, formerly president of Crawford Tank and Supply Company of Dallas, is now general sales manager for Maloney-Crawford. He will maintain headquarters in Dallas.

O. W. Maloney, son of the founder of the Maloney Company remains as president of the company. Mr. Crawford also is a son of a pioneer in the oil country equipment field, the late David Crawford one of the founders of the Parkersburg Rig and Reel Company.

CLAYTON TANKS
FOR OIL STORAGE
IMPORTANT CONTRACTS CARRIED OUT IN-
GT. BRITAIN FALKLAND IS.
GIBRALTAR BERMUDAS
CEYLON
CLAYTON, SON & CO. LTD
HUNSLET LEEDS, ENGLAND
LONDON OFFICE-2 VICTORIA ST SW1

INDICATING RECORDING N & Z CONTROLLING INSTRUMENTS

Instruments

Instruments of precision with a world-wide reputation.

Mercury-in-glass thermometers, mercury-in-steel dial and recording thermometers, pressure recorders, multipoint temperature indicators and recorders, liquid level gauges and automatic temperature controllers. Every instrument is supplied with a guarantee for two years.

NEGRETTI & ZAMBRA

122, Regent Street, London, W.1.

Established 1850

"YORKSHIRE" TUBES

In Copper, Brass, Aluminium, Cupro-Nickel, Aluminium-Brass, Phosphor Bronze and all non-ferrous alloys. Strong Light Aluminium Alloys.

also

"YORKSHIRE" COPPER TUBES AND FITTINGS

(Pat. No. 419521)

Ideal for Technical and Special Plant installation.

The YORKSHIRE COPPER WORKS LIMITED LEEDS

Forms Chemical Subsidiary

SHELL CHEMICAL CORPORATION has been incorporated in Delaware to operate the chemical business of Shell Oil Company. It will be a wholly owned subsidiary. J. Oostermeyer is president of the new concern. W. P. Gage and L. V. Steck are vice presidents. The head office will be located in the Shell Building, San Francisco, and a New York office will be maintained at 500 Fifth Avenue..

The new corporation will operate the three chemical plants in California at Shell Point, Martinez and Dominguez, and later will take over operation of Shell's chemical plant in Houston, Texas. The major products now being manufactured include ammonia, fertilizers, solvents and chemicals. It will also continue operation of the butadiene plant at Torrance, California, for the office of rubber reserve.

Rockwell International Corp.

TO coordinate the export activities of the various subsidiaries and divisions of the Rockwell Manufacturing Company, the Rockwell International Corp., with offices in the Empire State Building, New York, has been organized.

Under the active direction of A. L. DiGiulian, the Rockwell International Corp. will conduct export sales for the Pittsburgh Equitable Meter Company, Nordstrom Valve Company, Edward Valves, Inc., and establish export sales policies for the Delta Manufacturing Company, The V. & O. Press Company, Inc., and the Crescent Machine Company, all subsidiaries of the Rockwell Manufacturing Company. In addition, Rockwell International will handle export sales for several other independent companies.

The Rockwell International Corporation was organized after an extensive survey of the export market and sales offices have already been established in South and Latin America.

Form New Company

REPUBLIC EXPLORATION COMPANY, Tulsa, is a new organization formed by A. V. Dayton, Frank E. Brown and Frank B. Smith, all well known in the Southwest. Mr. Dayton was research director and assistant to the president of Engineering Laboratories, Inc., for five years. Recently he has been senior physicist for Armour Research Foundation at Chicago. Mr. Brown has been with Shell Oil Company for eleven and a half years, recently as district seismologist and assistant to the head of Shell's district geophysical department. Mr. Smith has been with Petty Geophysical Company for the past 12 years.

STEVENS

—TULSA Call 4-3072

Insulating Headquarters

• GASKETS

Gaskets of Copper, Aluminum or other metals. All types of Rubber Gaskets. We can build any size or type gasket—you furnish the drawing or template.

STEVENS Ring Type Cylinder Head Gaskets. Guaranteed not to blow-out or burn-out under high pressure. The best cylinder head gasket made for any gas engine your money can buy.

• PACKINGS

High Pressure Rod and Plunger and low Pressure.

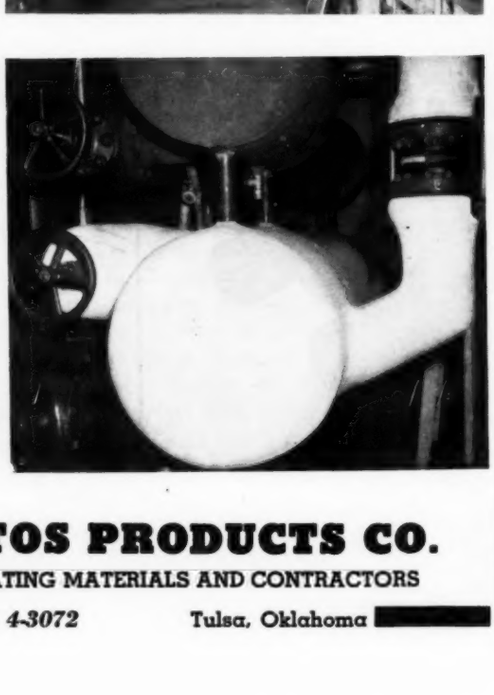
• INSULATING MATERIALS

Installed or F. O. B.

85% Magnesia
Vermiculite
Fibre — Felt

• SHEET PACKING

High Pressure Asbestos Sheets
Rubber and Neoprene Sheets



• LEATHER GOODS

U Cups and all makes of Hydraulic Leather Cups.

Factory Representatives with complete stocks of insulating materials. 33 YEARS' EXPERIENCE in Insulating. Gaskets and Packing Materials go into every STEVENS job.

STEVENS ASBESTOS PRODUCTS CO.

GASKET MANUFACTURERS INSULATING MATERIALS AND CONTRACTORS

322-4-6 East First St. Call 4-3072 Tulsa, Oklahoma

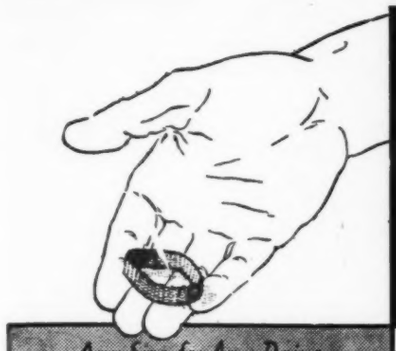
MERRITT-CHAPMAN & SCOTT CORPORATION

ENGINEERING CONSTRUCTION

LARGE PROJECTS ACCOMPLISHED IN RECORD TIME AND AT LOW COST

OIL WELL FOUNDATIONS
WHARVES, PIERS, BULKHEADS
RAILROADS
WAREHOUSES
OIL STORAGE TANKS
PIPELINES
LOADING LINES
COMPLETE INDUSTRIAL PLANTS

ENGINEERING CONSTRUCTION DIVISION
17 BATTERY PLACE, NEW YORK



Sole Manufacturers

LEWIS & TYLOR LTD

Power Transmission Engineers

CARDIFF

Great Britain

Any Size for Any Drive

GRIPOLASTIC Endless BELTS

"UNDERWRITER"

Super

FIRE FIGHTING HOSE

Branches and Agencies Throughout the World

GRIPOLY

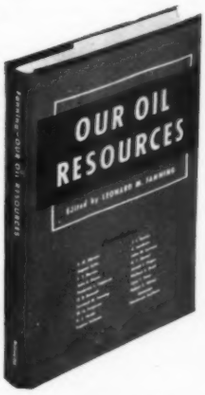
The Belting with the 4-plait Wear Resisting Edge

An authoritative, timely survey presenting the significant facts on

PETROLEUM

—key product of the postwar world

This symposium of experts is especially timely in these days when the problem of oil resources figures very high in the counsels of nations, the maintenance of peace, and in the raising of the world's standard of living.



Just Published!

OUR OIL RESOURCES

Edited by LEONARD M. FANNING

Author of *The Rise of American Oil*

331 pages, 5½ x 8, 30 illustrations, 71 tables, $4.00

This exhaustive, up-to-date study demonstrates the indispensable role of petroleum in our daily life — traces the part of private enterprise in the development of U. S. oil resources, analyzes vital considerations such as conservation, the role of technology, oil, natural gas, coal and shale reserves, oil in public domain, past production and present rate of discovery, geological distribution, number and capacity of U. S. refineries, by states, manufacture of liquid fuels from solids, anticipated future discoveries and estimates of future supplies.

CONTRIBUTORS

F. W. Abrams
Eugene Ayres
L. T. Barrow
John A. Brown
Frederick C. Coqueron
O. D. Donnell
Leonard M. Fanning
W. H. Ferguson
K. C. Heald
Eugene Holman
J. C. Hunter
A. Jacobsen
John M. Lovejoy
A. C. Mattei
Joseph E. Pogue
Wallace E. Pratt
Lyon F. Terry
Robert E. Wilson

ORDER YOUR COPY FROM

WORLD PETROLEUM

2 West 45th St.
New York 19, N. Y.

THE world-wide use of "AVO" Electrical Testing Instruments is striking testimony to their outstanding versatility, precision and reliability. In every sphere of electrical test work, on active service and in industry, they are maintaining the "AVO" reputation for dependable accuracy, which is often used as a standard by which other instruments are judged.

THE AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO., LTD.

WINDER HOUSE DOUGLAS STREET LONDON S.W.1

Motor Voltage Considerations in Oil Refineries

(*Continued from page 39*)

Another 2200 volt control equipment is the so-called "Metal Clad" switchboard panel type, employing oil circuit breakers of 50,000 KVA interrupting capacity, disconnectable by means of a lowering device. The cost of such a panel is approximately $2500. net (including controller, disconnecting device, bus and interconnections) indicating that even 200 HP motors should be for 440 volt service for economy, where such 2200 volt equipment must be used.

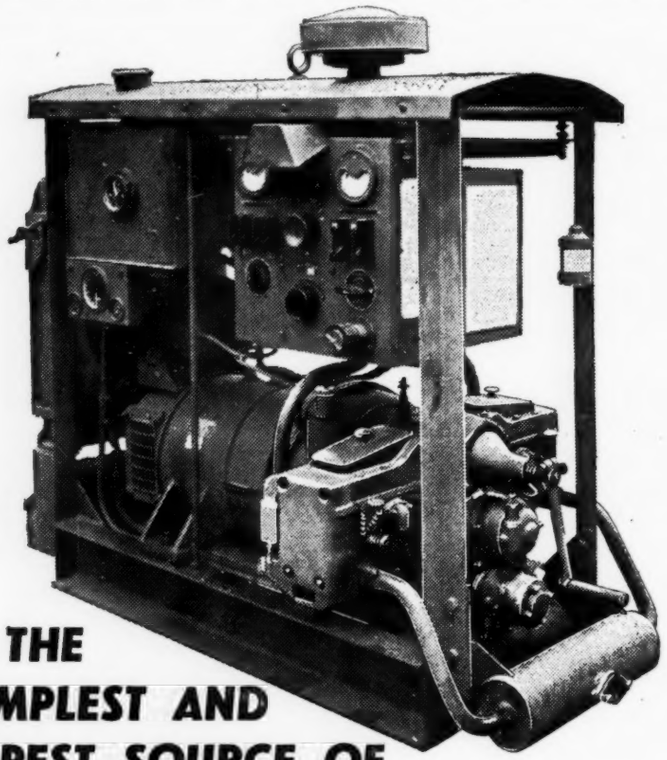
An analysis, similar to the above, but based on standard industrial equipment, was presented in a recent issue of the General Electric Review, by D.L. Beeman of the Industrial Engineering Division, General Electric Company*. Mr. Beeman's conclusions are that "For motors less than about 200 HP rating, reference to curves—will show that 440 volt motors make possible the least investment in the electric equipment, regardless of primary voltage. Thus, all motors rated about 200 HP or less should be operated on systems rated 600 volts or less, regardless of the primary voltage selected". He also states that "the effect of explosion-proof requirements will have little bearing on the basic factors . . .", which statement coincides with the analysis presented in this article. Mr. Beeman further states that "where a choice of primary voltage can be made, it is usually more economical to select 4160 volts than 2400 volts—even where the percentage of motors above 200 HP is as high as 50 to 60 percent of the total plant load".

As a rule, oil refineries use 2300 or 2400 volt systems with 2200 or 2300 volt motors for the larger sizes. Motors for 4160 volts are somewhat more expensive than for 2200 volts. The present approximate costs of 4160 volt, 3-phase, 60 cycle, 1800 RPM, squirrel-cage, explosion-proof motors are:

75 HP — $1550
100 HP — $1950
125 HP — $2360
150 HP — $2560
200 HP — $2960

The cost of control equipment and other items for 4160 volt service is about the same as those given in Table II. Therefore, in a new development where the choice between 2300 volt and 4160 volt distribution is not impeded by consideration for existing installation, the choice can be based on the saving in the distribution system effected by the use of the higher voltage, as against the higher cost of the 4160 volt motors.

*Industrial Power Systems, Pages 17 to 20, incl., General Electric Review, April, 1945.

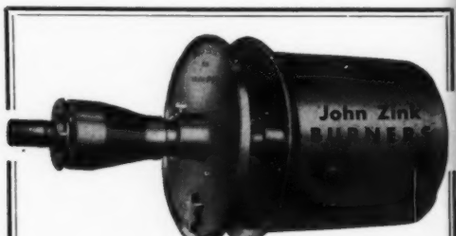


THE SIMPLEST AND CHEAPEST SOURCE OF 8-12 b.h.p. IS A

CUB DIESEL

The horizontal design of the "CUB" diesel gives inherent balance. It is a high-speed low-weight engine of 1006 c.c. capacity with a continuous heavy duty rating of 12 b.h.p. at 1,800 r.p.m. The "CUB" will start from cold, it will give good service for many years with practically no attention and uses very little fuel.

OIL ENGINES (COVENTRY) LTD.
Atlantic Works, Harefield Road, Coventry



For: Power Boilers — Gasoline Plant Boilers — Treating Furnaces — Industrial Boilers — Heating Boilers — Domestic Furnaces

Refinery Stills and Furnaces

◆

"JOHN ZINK PRODUCTS MUST BE GOOD"

JOHN ZINK COMPANY

4401 South Peoria Tulsa, Oklahoma